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End This Suspense!

The Prospect of Legislation

THE McGowan Committee on Electricity Distribution reported in May, 1936, and for a time the adoption of its proposals seemed to be considered by some sections of the community to be a matter of life and death as much for the nation as for the electricity supply industry itself. The Government several times promised early action and went so far as to issue a document (described by Mr. Selwyn Grant this week as the "curious White Paper") in which the country was neatly divided up between groups of undertakings which groups were said to form "convenient administration units." Few people in the industry appeared to welcome this document, but so far as we are aware it still remains the "basis for discussion" in any negotiations for the reorganisation of the industry.

A Congested Programme

What chance is there of any further action being taken by the Government? Even before the recent parlous state of international affairs arose it had its hands too full of more urgent matters. Sufficient indication has been given from many quarters that any legislation which is introduced is likely to have a passage far from short and smooth. As in previous cases of the kind there has been more than a suspicion of political flavour in the proposals to bestow upon the expectant electorate the benefits of a "cheap and abundant supply." Not, we admit, that nothing can be accomplished by legislation; the 1919 and 1926 Acts have no doubt benefited the industry and the community on the whole, in spite of the many grumbles about them.

But these distribution proposals are a different matter in that they get down to what may be called "personalities." The improvements which the earlier Acts have brought about have been mainly technical; the commercial (or, more properly, human) factor has occupied merely a corner of the picture. Now while the improvement of distribution involves a number of technical considerations, in the final analysis it is a matter of sales and the question becomes "Can Government control or supervision by statutory bodies increase the sale of electricity?" Experience would suggest an emphatic negative. It is perhaps true to say that the electricity supply industry during its first half-century succeeded in spite of legislation.

It is conceded that there are still undertakings which need "gingering up" but doubt has been accumulating whether an upheaval to bring these recalcitrants into line is worth while. There is no doubt, however, that the implied threats in the McGowan Report have had some effect upon the position. It might justifiably have been expected that the uncertainty engendered by these threats would have retarded development but, strange to relate, the general tendency has been rapidly forward.

It must be remembered that the proposals were intended mainly to benefit the domestic consumer: to increase the availability of supply and reduce the price. The McGowan Committee's report was based on figures for the year 1933-34. At the end of the 1936-37 period, three years later, the number of consumers had risen by 40 per cent. and the consumption of electricity for lighting, heating and cooking by 65 per cent., which certainly makes it appear as though the first requirement is being met in a satisfactory fashion.

As to price, in spite of the greatly increased cost of most of the raw materials used by the industry—coal, copper, lead and rubber—the average charge has fallen by 21 per cent. In quoting these figures at the annual meeting of the Provincial Electric Supply Association this week Mr. Selwyn Grant questioned whether such an advance could have been made under any Act framed on the lines of the McGowan Report or the White Paper. There is no means of telling, but until the whole of the population can obtain electricity at a reasonable price and use it freely there is no room for complacency.

What Can Parliament Do?

Whether or not, as has been suggested, the advance has been the result of a combined effort on the part of the supply industry to show that it is capable of putting its own house in order is beside the point. The progress has been made and will continue. Can any action by Parliament speed up this advance? Or would the upward movement have been faster if there had been no uncertainty with regard to the future of the industry?

The possibility of any legislation which will make a fundamental change in the structure of the industry now seems very remote. All that the Government could find time for would be a non-contentious measure or one which would meet with opposition only from those with reason to fear the results. Possibly a widening of the Electricity

Commissioners' powers would be acceptable to most parties—if the extent of the widening were not excessive. However this may be, one thing is certain. The Government must announce soon whether it is going to act or not. If, as is by no means certain, the existing suspense is not doing much harm it is surely not doing any good.

Those Examinations

SOME hard words were said about the examination system by Sir George Lee at the Old Faradians' dinner. His description of it as a battle of wits between examiner and examinee, designed to discover not what the latter knows but what he does not know, is often only too apt. He would, we gather, like to see the system abolished altogether. That possibly is unduly sweeping, as examinations have their uses if they are not regarded seriously as the be-all and end-all of academic training. Working to a syllabus he criticised as limiting the natural wish of a student to develop on wider lines. Too often it does so, but it need not, if it is understood that a syllabus is merely a practical method of canalising the work of the student under experienced guidance. In this the common antithesis between technical and liberal education (the last including training in leadership and team spirit through games) must be eliminated if the student is to become a useful citizen as well as a technician, and thereby a more effective technician. An engineer starts with a great asset in the world of affairs—a workshop experience during which he meets all sorts and conditions of men. A valuable feature of the "sandwich" system is that it provides for this at an appropriate stage in the training scheme.

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A Case for Electrification

To one accustomed to using the suburban services of the Southern Electric, travelling on some of the other lines out of London is something of an ordeal. The grimy stations depress, and the rolling stock is uninviting. Unless one is fortunate enough to find a carriage door open, a handful of soot must be gathered in making an entry. The compartment is redolent of stale sulphur which, however, is soon replaced by fresh supplies when the train moves off. At the end of the journey a bath is imperative. The railway companies are not convinced that electrification is economic, but their passengers have no doubt that from *their* point of view there is everything to be said for a conversion. Some will regret the disappearance of the "iron horse," but, after all, there was more romance in the stage coach.

Prepayment or Disconnection?

A CORRESPONDENT employed by an electricity supply authority draws our attention to a matter which, he states, is in urgent need of attention. It is the growth in the number of defaulting consumers through their inability to save the cost of the electricity which they use. He says that with the increasing popularity of the two-part tariff working-class people are using more and more electricity but still suffer from insecurity of employment, which forces them to spend their money on the sheer necessities of life. His remedy is the use of the prepayment meter to cover the fixed and running charges and any payments for wiring and fittings as this compels the consumer to pay for his service as and when he uses it. We know, of course, that this system is already widely employed but there are still undertakings which have not adopted it. It is worth their consideration, for the disconnection of a consumer is an unpleasant and unprofitable task.

Export Opportunities

APART from foreign markets, there is plenty of scope for British electrical manufacturers to increase their share of Empire trade. For instance, although South Africa purchases most of its electrical machinery from us, British manufacturers of other types of electrical equipment are not all so successful. According to the United States Department of Commerce South Africa was the biggest foreign purchaser of electric ranges during July. Last year the value of cooking and heating apparatus imported into the Union was £383,000; of this less than a third came from Great Britain, and with some other types of apparatus, notably vacuum cleaners, the proportion was still more unfavourable. With domestic development making great headway in South Africa equipment of this kind is in particular demand and greater efforts to meet competition from other sources of supply would be well worth while.

Regulations for Quarries

IN their final form the Quarries General Regulations (Electricity), 1938, which apply to all such places in which electricity is used, differ in a few details from the draft circulated for criticism by interested parties and reviewed by us on May 27th. The principal modifications relate to flexible metallic screens for cables, procedure as to British Standard Specifications, and maximum voltages for portable apparatus. The 25-V to earth for portable hand lamps on AC has been raised to 64 V, corresponding to 110 V three-phase, which now becomes the highest permissible for use with portable AC motors of 4 HP and under and other portable apparatus with an input not exceeding 4 kVA. It is not clear why a new voltage has been introduced so close to the 125 V which is standard in mining and industrial practice and which is given elsewhere in the same Regulations as the maximum in certain circumstances for AC working. It can hardly be a question of safety as, according to another paragraph, instructions for the treatment of persons suffering from electric shock need not be exhibited where the AC voltage does not exceed 125 V.

Cheap Heating

WHAT is all this talk about cheap gas? Writing in the *Gas Times* "Housewife" says:—

"If it could be arranged, I—and thousands of other housewives—would welcome a system, such as is practised by the electricity undertakings, that would make gas available at a reasonable price for all-day heating. That is, I suppose, what you call a two-part tariff. They—the electrical people—have offered one to me whereby I should pay about 15s. per quarter, according to floor space, and get electricity at ½d. per unit. There is an inducement to use the electricity freely. If I could get gas that way I would have *several* gas fires in my new home."

We can only ask "Why?"

Christmas Gifts

WITH alarming rapidity Christmas is again approaching and thoughts begin to turn to the selection of presents. And for electrical men the solution of the annual problem should be simple. In our issue of November 18th we hope to give some useful advice upon this subject.

Norwich City Hall

A fully automatic electric heating installation

THE new City Hall, officially opened at Norwich by Their Majesties, the King and Queen, last Saturday, has been described as East Anglia's finest new building. This statement may be considered true not only architecturally but with regard to the electrical installation also. The whole of the equipment is of the most up-to-date design and the heating installation in particular incorporates innovations which render it completely automatic and independent of human control. In fact, so reliable is the whole plant considered that it has been thought unnecessary to appoint a resident engineer.

[*Elec. Rev. photo.*
The new Norwich City Hall at night, showing floodlighted tower and illuminated gardens

The heating of the main building is carried out entirely (with a few special exceptions mentioned later) by means of concealed radiant hot-water ceiling panels fed from an electric thermal storage system. This comprises two 750-kW low-voltage (400-V) Reyrolle electrode boilers, which are thermostatically controlled on constant load by means of movable porcelain spacers, the electrodes themselves being fixed. Each of the boilers is controlled by a Reyrolle 2,000-A type "G1" motor-operated metal-clad circuit-breaker with a rupturing capacity of 50,000 kVA installed in the sub-station adjacent to the heating chamber, while the load-regulating, auxiliary controlling and recording apparatus is mounted on a control cubicle in a central position in the heating chamber. This arrangement enables all the normal adjustments to be made with the minimum of inconvenience at a central point, and, in addition, the exact condition of the whole of the electrical equipment can be observed at any time by referring to the instruments on the control cubicle. The load is an entirely off-peak one and the time switches are arranged so that the boilers are returned to low load before being switched off.

[*Elec. Rev. photo.*
Laylighting and one of the ornamental indirect pedestal units in the Council Chamber

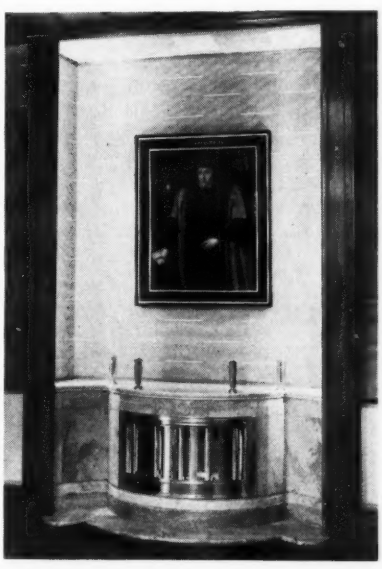
From the boilers the water is pumped to two 16,000-gal. cylinders, where it is stored at 250 deg. F. From these vessels the flow is mixed automatically by magnetically operated modulator valves, the return maintaining the desired flow temperature. For pumping purposes three identical pumps, each driven by a 5-HP, 925-RPM electric motor, have been provided—one for conveying the water between the boiler and the storage cylinder, another for circulation throughout the building, and the remaining unit as a stand-by for either purpose. Arrangements have been made for either boiler or either cylinder to be used without affecting the other.

For regulating the flow temperature an elaborate scheme has been devised by G. N. Haden & Sons, Ltd., the heating and ventilation contractors who, incidentally, have carried out all the electrical work connected with the plant they have installed. Utilising apparatus supplied by the Drayton Regulator & Instrument Co., Ltd., they have arranged for the flow temperature to be regulated in accordance with the temperature prevailing outside the building. At night and during the week-ends, &c., this system of control is removed by means of a Venner time switch which imposes a system of constant temperature control throughout the building.

Generally the system of heating described above covers the requirements of the building, but on the special occasions when the City Council or the various committees are sitting, a small plenum heating and ventilating system (Matthews & Yates air washer and fans) is brought into operation serving the Council Chamber, Committee Rooms, Lord Mayor's Parlour and Members' Rooms only. To avoid the risk of these rooms becoming overheated, "Satchwell" room thermostats (Rheostatic Co.) have been installed to operate magnetic valves (Magnetic Valve Co.) and so cut off the normal panel heating installation. The three electric motors required for the plenum pump and fans are controlled by Brookhirst equipment. At each end of the Committee Rooms and in a few of the principal officials' rooms attractive inset reflector fires (Bratt Colbran) have been fitted.

In addition to the building heating plant, separate apparatus has been provided for the domestic hot water services. In this case two 40-kW banks of Reyrolle immersion heaters have been fitted in a 2,000-gal. storage cylinder. The individual immersion heaters are rated at 3.3 kW and are of the withdrawable pattern. Like the electrode boiler plant, these are automatically controlled by means of Rheostatic thermostats, the maximum temperature in this case being set at 200 deg. F. Modulator valves are again employed to govern the outflow temperature and to circulate the water two pumps are arranged in duplicate. This again is an entirely off-peak load.

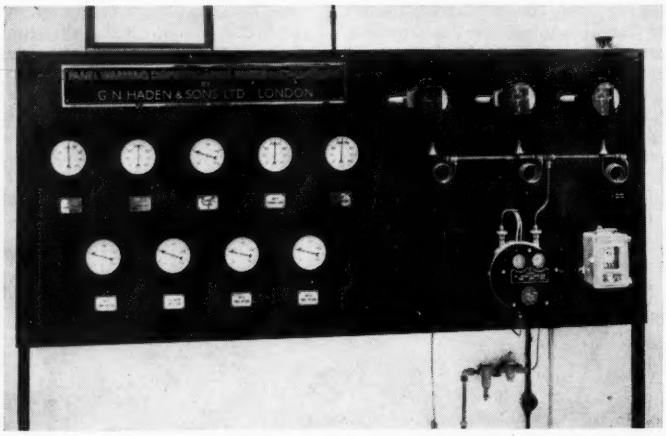
The most remarkable feature of the boiler house and the adjoining plenum room—with the exception, perhaps, of the size, for they are the most spacious of their kind we have yet seen—is the almost complete absence of noise. This is all the more surprising when it is remembered that there are normally six motors running. The reason is that here, as well as for practically all the other domestic services, including the three Express lifts, Bull "Super Silent" units



[*Elec. Rev. photo.*
An illuminated mantel recess and electric fire in one of the Committee Rooms

have been installed. These motors are provided with self-lubricating sleeve bearings and incorporate other special features aiming at eliminating noise.

Throughout the building care has been taken to ensure that the lighting arrangements harmonise with the general architectural scheme. Semi-indirect fittings have been favoured for the more decorative situations on the "ceremonial" floor and a number of attractive units incorporating bronze or stainless steel metalwork have been made specially by Hume Atkins & Co., Ltd. (to the architect's design) to suit the particular schemes in the Mayor's Parlour, Members' Rooms, &c. Incidentally, red lights appear outside these rooms when in use. Lay lighting provides the main illumination in the Council Chamber, four imposing pedestal units (Allom Bros.) supplying supplementary lighting in the corners. Folding doors enable the suite of five Committee Rooms to be used as one large room if required, and here, in addition to the decorative semi-indirect pendants, are, at each end, mantel recesses in which the portraits of past mayors are illuminated by concealed lights. In the entrance hall the lighting scheme includes three oblong stainless steel units, six daffodil-like pendants and a novel unit reminiscent of a mariner's wheel. Plain spherical fittings are used for general purposes, while for positions requiring somewhat more decorative treatment units with Saturn-like rings are employed. On the staircases semi-cylindrical units are mounted in the corners vertically.



[*Elec. Rev. photo.*

The flow temperature control panel, showing (right) the special device for regulating the temperature in accordance with the temperature outside the building

The arrangements for supplying electricity to the building are of somewhat unusual interest. Three separate incoming 6,600-V supplies, each capable of dealing with the full load, are received in a sub-station adjoining the boiler house. Controlled by Reyrolle circuit-breakers of 150,000 kVA rupturing capacity, these supplies are fed to three 1,500-kVA Bruce Peebles transformers, which, on account of the necessity for having electricity available while the building was being constructed, are situated underneath Guildhall Hill. The low-voltage (400/230-V) supplies are brought back to the opposite side of the sub-station at floor level and up, via 2,000-A circuit-breakers, to cables supplying not only the building itself and the adjoining police station, but premises in the vicinity as well. Lucy "tailless" unit type fuseboards and B.I. armoured cables are used.

The lighting, heating and power supplies for the building are all separate, and are controlled from a special low-voltage distribution centre situated in an adjoining room. Here three of the walls accommodate the lighting, heating and power distribution boards respectively, G.E.C. metal-clad switch and fuse gear being employed throughout. Metering current transformers are provided here, and leads are run back to a metering panel in the sub-station, all supplies being recorded separately.

Troughing is preferred instead of conduit for housing the v.i.r. cables, which incidentally are all of Glover's manufacture. Close to the fourth wall of the low-voltage distribution centre is a Lancashire Dynamo motor-generator for supplying DC for arc lamps, etc., used in the drawing office. Maintenance and alterations are greatly simplified by the grouping of all services, rising mains, water supplies, etc., in common ducts accessible from spacious cupboards situated on each floor.

Adjoining the City Hall is a new Police Headquarters, the electrical installation of which forms part of the general scheme. Here again the heating is by radiant hot-water ceiling panels, but in this case, instead of a system of electrode boilers, being used, the thermal storage cylinder embodies five banks of 50-kW Reyrolle immersion heaters controlled by thermostats operating Brookhirst contactors. The cylinder has a capacity of 7,000 gals., the pumps being duplicated. Each immersion heater bank is controlled by a Reyrolle unit type "HH" switch and fuse panel and a Brookhirst contactor. For the domestic hot-water service in the police block there is an 800-gal. storage vessel fitted with a 25-kW bank of immersion heaters under the control of switchgear similar to that used for the main building. Both installations are fully automatic.

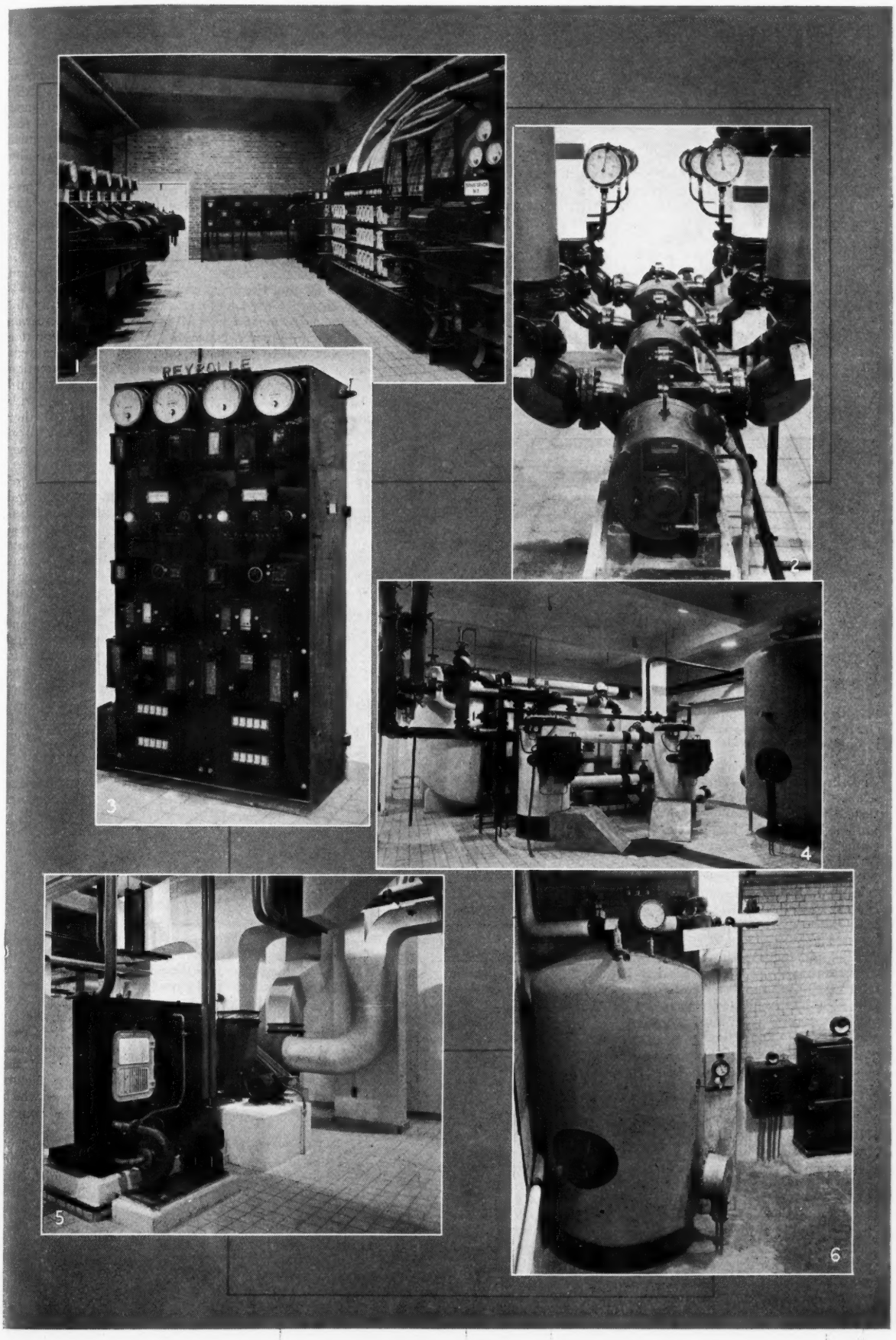
The electrical installation work in both buildings was carried out by T. Clarke & Co., Ltd., the architects being James & Bywaters & Roland Pierce.

As a part of the general scheme the City Council has taken the opportunity to install a system of "Osira" colour-corrected electric discharge lighting covering the whole of the forecourt. Immediately in front of the building have been erected five cylindrical fittings incorporating fluorescent opal glass and mounted on specially designed bronze pedestals. In front of these in the adjacent gardens ten cup-shaped units have been provided. Both types of fitting, which have been supplied by the G.E.C., house 125-W electric discharge lamps. To serve the roadway and shops, there are four four-lamp "pylon" lamp standards, 35 ft. high, and eight single-lamp units, each containing 400-W fluorescent electric discharge lamps.

Floodlighting of the tower is to be a regular feature and, like the other exterior illumination, is time-switch controlled. Apparatus used consists of four pairs of G.E.C. projectors. In the tower is a Gillett & Johnston chiming clock comprising four separate synchronous units. There is also a Synchronome system of electric clocks serving the building proper.

[*Elec. Rev. photo.*

Specially designed lighting fittings produce a pleasing effect in the entrance hall and the Committee Rooms



Special features of the electric heating system at Norwich City Hall (see preceding pages)

1. The sub-station. 2. Pumps, driven by Bull "Super Silent" motors, for the thermal-storage system. 3. The Reyrolle electrode boiler control cubicle. 4. A general view of the heating chamber, showing the electrode boilers and storage cylinders on the left and the domestic hot water cylinder on the right. 5. The plenum plant. 6. The domestic hot water cylinder in the Police Station *[Elec. Rev. photos.*

What Supply Companies are Doing

Progress without legislation

THE annual general meeting of the Provincial Electric Supply Association was held on Monday last in London, when Mr. Selwyn S. Grant (chairman), in the course of his speech, referred to the death of Mr. R. W. Edwards (a member of the Executive Committee), and the resignation of Mr. C. R. Akers. The new members were Messrs. A. V. Barraclough and Mr. W. Fennell. The membership of the Association had remained practically the same and it continued to stand for the major part of the company operated areas throughout the country.

As an instance of co-operation with kindred associations, Mr. Grant said that they had participated with the Conjoint Conference of Public Utility Associations in its work in connection with the Coal Bill. While the coal-selling schemes were still unsatisfactory, they had been substantially improved by the amendments secured as to the proceedings and constitution of the Committees of Investigation. Through the Conjoint Conference they were successful in securing protection in regard to a number of road and building clauses in Bills before Parliament, and, as usual, had to fight again on the vexed subject of mains and cables under highways. A Joint Committee of both Houses was to consider the position of

[*Elliott & Fry* [*Whitlock*

Mr. J. C. Dalton, secretary of the Provincial Electric Supply Association, and Mr. Selwyn S. Grant, O.B.E., chairman

public utilities in connection with road authorities. Acting together with the gas interests, they had secured a protective clause in the Hire-purchase Bill putting utilities in a privileged position so far as installation work was concerned, although as to the hire-purchase of goods, they were in the same position as ordinary commercial undertakings.

The Green Belt (London and Home Counties) Bill contained clauses prohibiting the erection of electricity stations and the placing of lines overhead or underground across restricted land unless numerous consents were obtained. A petition against the Bill was deposited, and the clauses to which objections were taken were considerably modified by negotiation. It is to be anticipated that similar Bills will be introduced for securing open spaces round other large cities. Referring to the Electricity Supply (Meters) Act, 1936, Mr. Grant said that they had had frequent conversations with the Electricity Commissioners on the technical problems involved and had recently been asked to consider the procedure to be adopted by meter examiners as to the determination of the accuracy of disputed meters and the fees to be charged.

Wiring Regulations Protest

They had been engaged in reviewing a new draft of the 11th edition of the I.E.E. Wiring Regulations but had had to protest that the time allowed for this was insufficient. They viewed with some alarm this periodical revision of the Wiring Regulations and the complicated form they appeared to be assuming. They had been invited to join a committee set up to consider compulsory wiring regulations and registration, but had declined because they considered that the principal result would be the creation of another body of inspectors for which the consumers would have to pay. A deputation from the Executive Committee recently appeared before the Electricity Commissioners to discuss air raid precautions and as one result, a nominee of the Association has been appointed to the National Committee.

They were in frequent contact with the Inland Revenue authorities on income tax matters, and negotiations had recently been concluded which would probably result in an increase of the rate of wear and tear allowance from 5 per cent. to 6¼ per cent. on all generating plant for base and peak load selected stations for the next ten years, at the end of which time the rate would be reconsidered. Notwithstanding the passing by Parliament of the Rating (Postponement of Valuations) Bill they had had occasion to draw the attention of member companies to the attitude being adopted by certain rating authorities in requesting information for the purpose of carrying out reassessments during the quinquennial period. It was the Association's view that, although the information asked for could not be withheld, it should be made clear to the authorities that it was given without prejudice to any contention which might be raised as to the legality of the proposals.

The Distribution Proposals

Dealing with possible legislation on electricity distribution the chairman said that the Joint Committee of Company Associations was in active session for a time but subsequently did not have occasion to meet again until recently and there was nothing further to report. Since the McGowan Committee made its report which was based on statistics for the year 1933-34, in a short period of three years, the consumption of electricity in the whole country for lighting, heating, and cooking had increased by 65 per cent. and the average price had decreased by 21 per cent. He very much doubted whether that would have been achieved by an Act of Parliament on the lines of the McGowan Report or the curious White Paper which followed.

In that period of three years, moreover, the number of consumers added to the mains increased by 40 per cent. and there had been achieved a great improvement in the utilisation of capital expended. At the time of the statistics used in the McGowan Report, for every £100 spent there were some 2,460 kWh of electricity sold, whereas the latest figure was 3,009 kWh sold, an increase over the period of 22 per cent. The figures were still more remarkable when it was considered that the wholesale prices which the industry had to pay for its raw materials had increased in such proportions that, without this spirit of enterprise, the industry would have been justified in increasing its prices rather than in showing a 21 per cent. decrease. In the same period the price of coal went up by 11 per cent., copper by 31 per cent., rubber by 105 per cent., lead by 63 per cent., and steel by 27 per cent.

When, too, the recommendation was made by the McGowan Committee that a number of the smaller undertakings should be absorbed, the figures before them showed only seventy-five undertakings in the country who were charging an average price of under 2d. per kWh for lighting, heating, and cooking. Three years later there were 194 undertakings claiming this low average price and those 221 undertakings which were held up as bad examples, charging an average price of 4d. a kWh or over at that time, had decreased to a total of only seventy-six.

Still Threatened

Had a distribution measure been passed, they would probably to-day be trying to raise possibly very large sums of money for compulsory purchases, and they would have been in the midst of a thorough dislocation of business in the face of all the present economic disadvantages. It was, in fact, a stroke of good fortune for the industry and, he suggested, for Parliament, that legislation had not been introduced. Nevertheless, it was still hanging over their heads and they continued to await with some anxiety what form it would take. They could only hope that the extraordinary history of the industry during the last four years against adverse factors would be taken into account and that no measure which was likely to dislocate the present progress would be brought forward.

In conclusion, Mr. Grant referred to the unity of interest with the power companies and London companies. They had for the three Associations the Joint Committee of which Mr. Dalton acted as chairman. He also paid a tribute to the Electricity Commissioners for the courtesy and goodwill which they invariably extended to the Association.

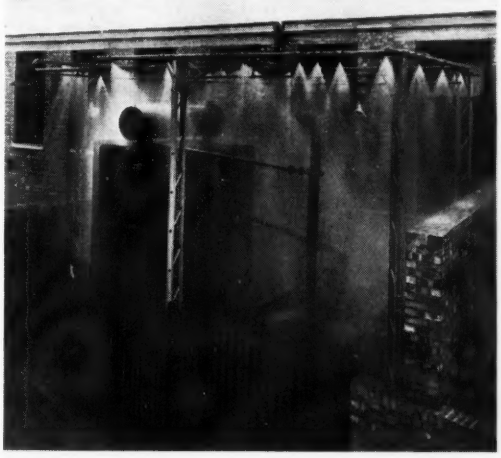
Sir Bernard Greenwell (County of London E.S. Co.) thanked Mr. Selwyn Grant and said that the co-operation between the company associations was valuable in view of the proposed legislation. It might be necessary to get rid of small and inefficient units, but smallness was not a reasonable basis for sinking any undertaking. He could not agree that the industry could be run on Post Office lines—"robbing Peter to pay for Paul." Rural dwellers could not expect to get the same rate as town dwellers, but still hundreds of villages with no water supply had electricity. Unfair legislation would hurt the consumer more than anybody else. He maintained that the companies could raise capital cheaper than the C.E.B. or the Joint Electricity Authorities.

Fulham Central Sub-station

A novel control room

THE erection of the new power station at Fulham brought about the necessity for centralised control of feeders to the seventy-two sub-stations in the area. The new "Central Sub-station" officially opened last Friday by the Mayor (Councillor T. M. Fox), is adjacent to the power station in Townmead Road. The building is divided into four isolated sections, two being arranged to give a duplicate supply to each area, one housing the bus section switch and the fourth the control room. The ground floor is devoted to cable work and the first floor to the switchgear. The main transformers are outside the building, and are fed by 66-kV cables running in separate tunnels from the power station.

The control room embodies features not previously used in this country. Instead of the usual mimic diagram the control board itself comprises the diagram, the live circuits being automatically traced out on the board with strip lighting. The instruments are of the moving-coil type with a thermometer vertical-gauge, the indication appearing as a moving column of light. This enables the operator at the desk to note the readings at a glance. There are also light indicators to show when an instrument is faulty. When a breaker is closed the corresponding light strip is vertical and forms a continuous line with the rest of the circuit but when the breaker is opened the light assumes a horizontal position. The board has a smooth laminated-glass surface without projections. The control room has been chosen as a light demonstration room for potential consumers, 200 ft. of fluorescent tubing being used in conjunction with overhead lay-lighting.



The "Mulsifyre" fire protection system in action on the transformers

The board forms a crescent with the bus-section and common instrument panel in the centre. At its right-hand extremity is apparatus for automatic control of the thermal storage plant at Earls Court. At the other extreme a panel accommodates the fire protection indicators and testing switches. The illuminated diagrams are produced in the glass laminations in combination with colour filters on the rear surface by means of miniature lamps supplied with low-voltage current from a switchboard in the basement, power being normally transformed from the AC network. An automatic change-over contactor and battery of secondary cells provide an emergency supply.

Two vertical sheet-steel cubicle boards, on which the protective relays and control fuses are mounted, are placed behind the control board. In the station paper insulated lead-covered multicore control cables are employed between the metal-clad pillars and relay boards, and v.i.r. lead-covered cables between the relay boards and control board. Those in the basement are laid in perforated metal trays.

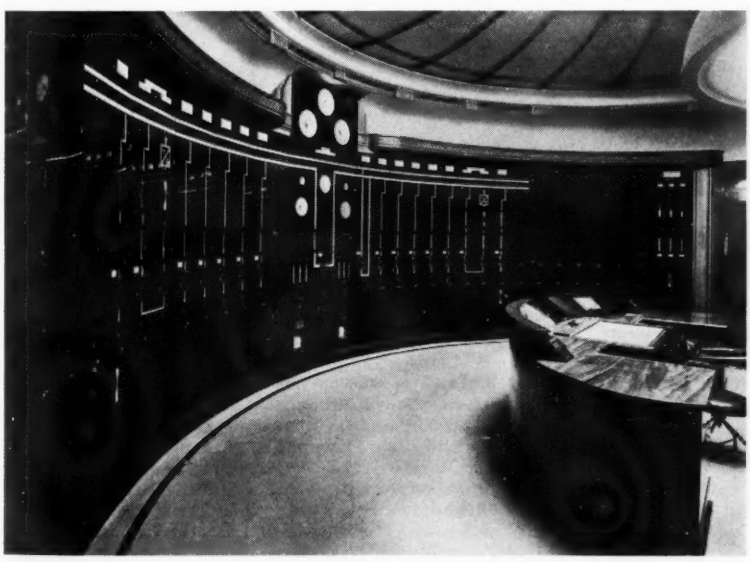
The switchgear is of the metal-clad horizontal draw-out type, operating at 6,600 V, but insulated throughout for 11,000 V. The circuit-breakers are of 750 MVA rupturing capacity and are fitted with de-ion grid arc control. Duplicate bus-bars of 3,000 A capacity are contained in compound-filled, phase separated chambers and all switch pillars (except the bus-section and bus-coupler) are fitted with oil immersed, manually-operated "on-load" bus-bar selector switches. Where parallel cables are employed, one cable can be disconnected by draining the oil from the link chambers and then removing the links and replacing the oil so that the joint box need not be broken down. The switchboard comprises two 3,000-A main transformer pillars, ten 800-A feeder pillars, two 800-A Scott-bank transformer control units, one 3,000-A bus-coupler pillar and one 3,000-A bus-section pillar. The circuit breakers are DC solenoid operated and may be controlled either from the remote control panel or at the switch.

An outdoor type liquid resistor is employed for earthing the neutral point of the 6,600-V side of each transformer.

Fire protection arrangements include the usual oil drainage beneath the switches and the separation of the multicore cables from the power cables. Bus-bar protection on the Metropolitan-Vickers frame leakage system is installed. The general system of fire-fighting employed is the "Mulsifyre" using atomised water under high pressure with "Grinnel" quartzoid bulb detectors.

Waste heat from the transformers has been used to heat the building.

The sub-station was constructed under the direction of Mr. W. C. Parker (borough electrical engineer) and Mr. H. Clarke (chief generation engineer). The principal contractors were:—Bastian & Allen, Ltd., heating and ventilating; English Electric Co., Ltd., high-voltage switchgear and control and relay boards; General Electric Co., Ltd., lighting equipment; Mather & Platt, fire fighting apparatus; and Stoner & Saunders, Ltd., architectural features for control-room lighting.



The control room showing the illuminated diagrammatical board

High-frequency Electric Furnaces. By F. R. Smedley

Regarded only a few years ago as an interesting laboratory tool, the high-frequency coreless furnace has developed rapidly into a full-size unit rivalling successively the crucible, the arc, and even the open-hearth furnace.

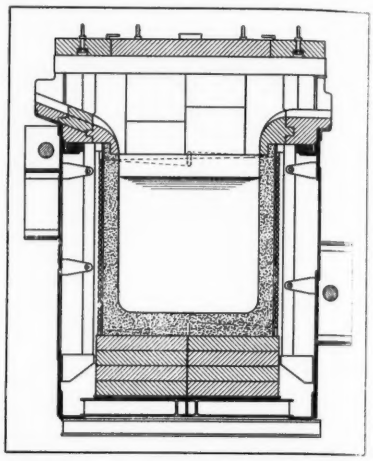
VERY briefly, the high-frequency induction furnace consists simply of a water-cooled copper coil surrounding a tube of electrically insulating material. Into this tube is placed a crucible, which contains the substance to be heated and is surrounded by heat-insulating refractory material. If the substance to be melted or heated is a conductor of electricity the crucible may be of non-conducting material, such as clay or magnesite; but if a non-conductor is to be heated or melted, a crucible made of conducting material, such as graphite, must be used. The latter condition chiefly arises in laboratory work as, of course, the bulk of industrial meltings consist of metals, but the point serves to illustrate the principle of the h.f. induction furnace, heat being produced in any electrically conducting substance by the resistance of the material to the h.f. current induced by the surrounding copper coil, which, in turn, is water-cooled to control its own temperature rise.

These furnaces can be conveniently divided into two classes according to the method used for generating the high-frequency current: (1) those in which a motor generator is used and (2) those of the spark-gap or thermionic valve type.

1

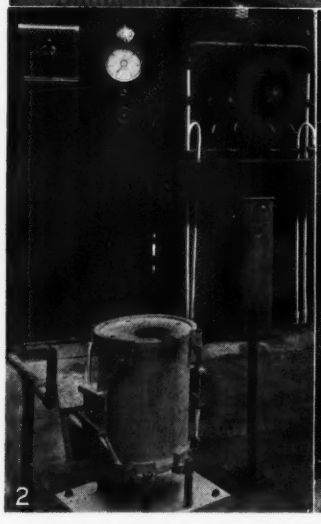
The former are far more efficient, and for most commercial purposes they are to be preferred. However, the spark-gap type of furnace has advantages for certain purposes which the motor generator type does not possess, the chief being that any frequency can be obtained from the convertor by suitable design of the furnace coil, whereas a motor-generator set works at one frequency. The spark-gap equipment is also more suitable for obtaining the very high frequencies required for very small furnaces, such as those employed for laboratory research and for the melting of high temperature metals and alloys, such as platinum, tungsten-carbide, &c.

Apart from laboratory work, there are many commercial operations involving the melting of small quantities of precious metals and alloys. Therefore, the spark-gap type induction furnace employing high-frequency current generated by charging and discharging condensers has found a wide application. The ability to obtain a wide range of frequencies by use of the spark-gap condenser method of generation is of great importance when dealing with a wide range of temperature and varying quantities of metal. The capacity of the circuit being fixed, changes of frequency are obtained by altering the size of the furnace coil, which, of course, alters the inductance of the circuit.



Section of a large h.f. electric furnace showing water-cooled copper coil

A spark-gap convertor is shown in the background of photograph 2. The main switch control handle, wattmeter and fuses mounted on a slate panel are shown on the front of the cage. In addition to the visible equipment, the h.f. convertor consists of a special oil-cooled transformer to step the voltage up to that required for charging the condensers, a bank of condensers, spark-gap, and safety gaps. Various special features are attached to the spark-gap, which is of the non-rotating type, designed to secure a quick cut-off at whatever part of the cycle the discharge takes place. The h.f. current circuit is separated from the low frequency high-voltage circuit by means of two banks of condensers. The convertors are made for single-, two- or three-phase working in sizes of 7, 15 and 35 kVA.



2

3

1. A modern steel shop with 2-ton and 5-ton h.f. furnaces. 2. A small h.f. furnace. In the background there is a spark-gap convertor and a water circulating system supplying several furnaces. 3. A melting shop equipped with forty-two small h.f. furnaces. The uncovered furnace connections will be noted: h.f. currents of the magnitude used cannot cause a dangerous shock and therefore the furnaces can be operated as shown in perfect safety

Small h.f. furnaces are principally used for melting platinum, gold and silver commercially; making alloys where freedom from carbon is essential and thorough mixing is required, such as special nickel-iron alloys used for submarine cables, high-frequency transformers, &c.; manufacture of alloys of the tungsten carbide group melting at 2,000 deg. C. to 2,200 deg. C.; and research work of various kinds, including work *in vacuo*. For the making of alloys the h.f. furnace has

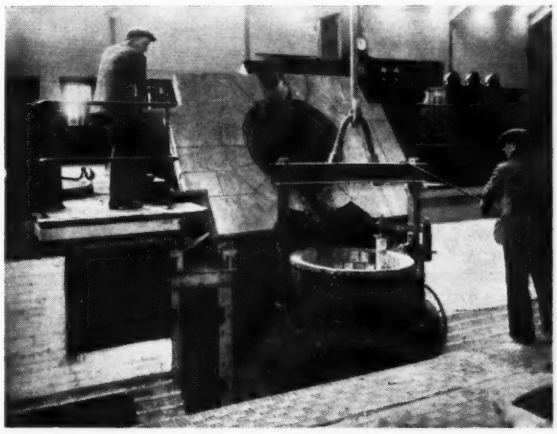
the great advantage of strong electrical stirring, so that the alloy is perfectly homogeneous.

Since the first commercial h.f. furnace for making high grade steel, of a capacity of 150 kW for "heats" of about 5 cwt., was installed in Sheffield in 1927 by the Electric Furnace Co., Ltd., a large number of 300, 400, 650 and 1,250 kW capacity have been installed, ranging in size from 7 cwt. to 7 tons, and the maximum capacity has by no means been reached. It will be appreciated that the induction method enables steel to be melted under ideal conditions. There is no contamination from gas or coke; the heavy labour of the crucible process is avoided; there are no electrodes, which is the principal weakness of the arc furnace; melting is rapid and there is the stirring by electrical forces, which ensures perfect homogeneity of all classes of steel. In the picture of a 5-ton Ajax-Northrup furnace, the "power-house" atmosphere of the background gives a good idea of the cleanliness surrounding the operation of even the large h.f. electric furnace.

In the early stages two factors tended to limit size, namely, the provision of a suitable crucible and the construction of a sufficiently robust outer casing. The crucible problem was overcome by the placing of a metal crucible-shaped former in the furnace coil and surrounding it with dry powdered lining material. Upon switching on the former was heated by induction and by the time it was melted the inner part of the lining was fritted, or half fused, and so made an ideal lining. The smaller h.f. furnaces had outer casings made of wood, and later, in the larger sizes, of asbestos with brass angles. When still larger furnaces were produced something more substantial was required, and the problem of shielding an outer casing of metal from induction was solved by surrounding the operating coil with a magnetic shield made of standard transformer iron laminations. This shield also reduces the reluctance of the magnetic path outside the coil. Steel outer casings are now standard on all the larger furnaces.

As mentioned earlier, h.f. current for the larger furnaces is supplied by a motor-generator set. Such a machine, in addition to suitable starting gear, is equipped with a bank of condensers, switches to vary the number of condensers in circuit so as to maintain a high power factor under the varying electrical conditions, and enable the full output of the generator to be taken at all stages of the heat, and the necessary indicating instruments. For the largest size of furnace automatic regulation is usually recommended.

Some little time ago a 1,250 kW motor generator set by the Metropolitan-Vickers Electrical Co., Ltd., was put into operation by the Electric Furnace Co., Ltd., at one of the large Sheffield steel works. It is arranged to supply energy alternatively to a two- and a five-ton furnaces of their design and construction. The former is used for melting cold scrap and the latter for refining liquid metal taken from an open-hearth furnace, and occasionally for melting scrap. These



A 5-ton Ajax-Northrup h.f. furnace showing tilting action for pouring

furnaces are used for the production of the highest grade steels.

The incoming supply to the motor generator is three-phase, 50 cycles at 10,000 V; the motor is tap-started by means of an auto-transformer which is cut out of circuit when the set is at work. The generator is a patented inductor homopolar single-phase high-frequency machine, operating at 1,100 cycles per second, with two 625 kW stators and a common rotor built as a single unit with a maximum output of 1,250 kW. The complete set is installed in a building some distance from the furnaces. Full automatic control of the voltage, power and power factor is arranged and condensers are switched in and out automatically as required, so that the power factor is kept at approximately unity throughout the heat. Other automatic equipment takes care of the water supply to the furnace coils, tripping out or preventing starting should the flow be at fault; red and green lights act as a tell tale on the correct functioning of the whole of the system; hydraulic rams control the pouring of the furnaces, and manual effort everywhere is reduced to the minimum.

"Velox" Boilers at Wellington, N.Z.

WITH a view to securing quick starting and automatic operations in an emergency and peak-load steam station, which has been designed to run in conjunction with the Mangahao hydro-electric plant, the City Council of Wellington, New Zealand, has recently put into commission two oil-fired "Velox" steam generators. These, the *Electrical & Radio Trader* states, are the first commercial units of the type to be installed in the British Empire. Each has a continuous evaporative capacity of 90,000 lb. per hr., with an overload rating of 10 per cent. for two hours.

Combustion takes place under a pressure of 30 to 40 lb. per sq. in. (gauge) in a cylindrical steel cylinder (three per boiler) lined with evaporator elements. The flue gases travel at about 610 ft. per min. (about twenty times as fast as in a conventional boiler), passing the superheater sections which are disposed one on each side of the evaporator elements, to a gas collector. From here they go to a gas turbine at 900 deg. F. and thence to the economiser and finally to atmosphere. The gas turbine drives an air compressor which creates the pressure in the combustion chamber; it is started by a 385-HP variable-speed DC motor with Ward-Leonard control geared to the compressor. At times of heavy load the gas turbine may produce more power than that required for driving the air compressor, in which case the motor feeds current back into the auxiliary supply system, the motor of the Ward-Leonard set acting as a generator.

The main parts of the water-steam system consist of: (1) An evaporator, 8 ft. in mean diameter by 18 ft. high, connected to a tube system surrounding the combustion chamber with water-cooled top and bottom covers and a single oil burner accessible from a top platform; (2) a steam-water separator, 3 ft. in diameter by 22 ft. high, which returns dry saturated steam to the superheater and discharges surplus water to a recirculator pump; (3) a gas-tube feed-water heater, 4 ft. 6 in. in diameter by 19 ft. high, which transfers heat from the exhaust of the gas turbine to the incoming feed before the latter is taken into the water circulator system. Water is in constant circulation, being drawn from the bottom of the separator by a pump which sends it through the evaporator elements at about ten times the rate of evaporation at normal full load. The mixture of water and steam leaving the evaporator elements is returned to the top of the separator which it enters at high velocity through a tangential nozzle that imparts a swirling motion. The water in the lower part of the separator is automatically maintained at a constant level. Part of the heat liberated in the combustion chamber is transmitted by direct radiation to the evaporator elements, but the small dimensions of the unit and its quick response characteristics are mainly due to the high rates of heat transfer that take place during the passage of the gases at high velocity through the flue tubes.

On test the following figures are reported to have been obtained: Starting from cold to full output, 3 min. 38 sec. with only one operator; overall efficiency (not including feed pump), half to full load, 95 per cent., overload 94.5 per cent., quarter load 93 per cent. The makers, Brown, Boveri, claim that half load can be suddenly switched on without risk of priming and with a momentary pressure drop not exceeding 40 lb. It is anticipated that under service conditions the time required for the starting of the Diesel house set to the loading up of a 15,000-kW turbo-alternator will be about 20 min. from a dead cold station.

Large American Water-power Scheme

Provision is being made for the erection of a power station at each end of the Grand Coulee Dam. In the first station there are to be nine 108,000-kVA 120-RPM 13.8-kV 60-cycle vertical-shaft alternators, and three house-service units. Six of the main sets will supply power for driving irrigation pumps situated upstream. The latter will be driven by 65,000-HP 13.8-kV synchronous motors, two from each generator. The first three 108,000-kV alternators have just been ordered and are, the *Electrical World* states, the largest in the world.

A Hospital Installation

Precautions taken against failure of supply

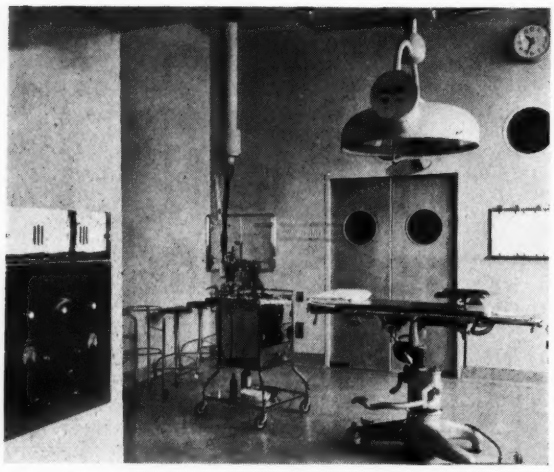
RELIABILITY and continuity of electricity supply are of paramount importance where hospital installations are concerned, and it is because of the precautions taken in this direction that the new extensions of the Children's Hospital in Great Ormond Street, London, W.C.1, are mainly noteworthy.

Two quite separate and distinct 400/230-V, 3-phase AC supplies are taken from the St. Pancras Borough Council's adjoining sub-station and are fed *via* Parmiter, Hope & Sugden circuit-breakers and ironclad switch and fuse gear, to rising mains carried straight up the east and west sides of the building respectively. It is thus possible to obtain both lighting and power supplies on every floor from either main. All that is necessary to change over from one supply to the other is the removal and insertion of the appropriate links in the distribution boards provided on each floor, the arrangement being in effect a ring main with the final link missing.

Actually for distribution purposes the building is divided into three sections—east, centre and west, the centre section being connected with the east and west supplies respectively on alternate floors. A particularly neat layout has been secured for the individual distribution boards which have been constructed by the Millns Electrical Co. to the design of the consulting engineers. All the power cables are taken to one side and all the lighting to the other, a solid neutral being provided. Instead of fuses, Nalder Bros. & Thompson 15-A circuit-breakers with earth leakage trips are used on every power circuit, while check meters are fitted both for lighting and small power. Slots are provided at the sides of the boards so that the main cables can be readily withdrawn, and a removable link enables the mains to be isolated from the switchroom.

Should both main electricity supplies fail a Chloride "Keepalite" emergency lighting system is automatically brought into service. This is uncontrolled so far as the operating theatre is concerned but can be switch-operated in the corridors, &c.

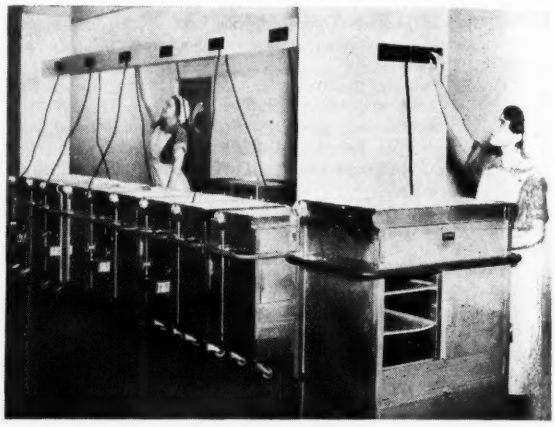
Staff location is another matter to which especial attention has been paid. When a particular member of the staff enters the building the appropriate switch on an "In-Out" indicator in the vestibule is pressed, thereby illuminating the name on the board and at the same time notifying the telephone switchboard operator. To locate a person one gets into touch with the telephone operator who causes a flashing signal to appear on the appropriate numerals of the "Instanta" electric clocks fitted throughout the building. The clocks are run from "Exide" batteries.



One of the operating theatres at the new extensions to the Children's Hospital, Great Ormond Street, W.C.1. (Note the plug sockets on the operating lamp and also the illuminated clock numerals used for staff location) [*Elec. Rev. photo.*

The telephone installation comprises, in addition to the G.P.O. lines, a 200-line automatic telephone installation (Automatic Telephone & Electric Co., Ltd.) operated from Alton batteries equipped with an auto-charger. The fire alarm system is operated in conjunction with the automatic telephones, the dialling of a certain number setting various bells ringing. A special indicator in the entrance hall comes into operation in the event of the failure of the lifts (J. E. Hall), of which there are five—four general and one serving the private wards on the seventh floor only. All the wiring for the telephones and signalling systems is carried straight up through the building in small ducts.

Special features of the three operating theatres are the facilities provided for utilising electrical apparatus. As a means of providing the variable voltage supplies required for the surgeons' headlamps, inspection lamps, cauterisers, &c., a special panel has been constructed by the Millns Electrical Co. to the design of the consulting engineers, the necessary sockets being situated in the operating lamp for which the Technical Lights & Equipment Co., Ltd., was responsible. Walsall mercury switches are employed throughout the theatres to obviate any risk of explosions occurring when certain anæsthetics are used. X-ray viewing cabinets (Watson) have been inset in the walls. The equipment of the X-ray rooms was carried out by the Victor X-ray Corporation, Ltd.



Electrically heated food trolleys on circuit [*Elec. Rev. photo.*

For keeping patients' food hot while serving there are sixteen electrically heated trolleys (Magrini) constructed of stainless steel. For these special plug sockets are provided in the kitchen, their 800-W elements being utilised to keep warm the water which surrounds the food containers. Other electrical apparatus in the kitchens includes Lightfoot refrigerators, a Peerless mixer and a potato peeler. Two laundries, one for normal work and the other for contaminated articles have both been equipped by D. & J. Tullis, Ltd., with washing machines and hydro-extractors, all driven by Crompton Parkinson motors.

Although the main heating of the building is effected by means of hot-water panels served by a coal-fired boiler (for which incidentally Benham & Sons, Ltd., have just fitted a CO_2 recording panel), portable electric fires are to be found in several of the wards, &c., to provide supplementary warmth.

A ventilating system serves a number of the rooms, remote control being provided in the case of the operating theatres. Special control boards incorporating Ellison circuit-breakers are situated on the top floor, one at each side of the building, covering the ventilation and X-ray equipment and also the lifts.

Special adjustable telescopic lighting fittings of Swedish design supplied by Troughton & Young, Ltd., are used over the beds throughout the wards, while for general illumination elsewhere plain spherical (G.E.C.) and semi-spherical (Troughton & Young) units have been installed. Inset radio loud speakers (B.T.H.) in every ward are operated by a central receiver in the basement. The whole of the electrical installation work was undertaken by the Bective Electrical Co., Ltd., who employed B.I. cables and G.E.C. conduits and fittings throughout. J. Stinton Jones & Partners acted as consulting engineers.

Swiss Electrical Industry

THE value of the exports of electrical machinery and apparatus from Switzerland increased from 38,804,000 Swiss fr. in 1936 to 52,051,000 fr. last year, all classes of manufactures contributing towards the improvement. The quantities exported, however, did not advance in the same proportion as the value owing to the devaluation of the Swiss franc and the increase in works prices. The imports of electrical manufactures in 1937 were valued at 25,020,000 fr., as compared with 16,350,000 fr. in 1936. The growth in imports principally concerned electrodes (60 per cent. from Germany), radio apparatus, dynamos, incandescent lamps and accumulators. The chief supplier of electric carbons last year was France, which was second, after Germany, in the supply of accumulators.

Bus-bar Loading for Traction Sub-stations

A new method of inserting resistance when regenerated energy cannot be absorbed by the system

WHEN a trolley-bus is in a section by itself and energy regenerated during braking can be absorbed by throwing a loading resistance across the line by means of contactors operated by a relay which responds to the excess bus-bar voltage, the time between the initial voltage rise and the final closing of the main contactor may be as much as half a second. The time constant of a trolley-bus motor, when regenerating, is short compared with the delay time of the contactor loading equipment, and in this period the regenerated voltage may build up nearly to its maximum value, *e.g.*, from 550 to 1,100 V, as shown in the oscillogram, although the contactor delay in this case was only ½ sec. since the main loading contactor was operated directly from the voltage response relay.

Apart from the strain on insulation and the burning out of lamps due to such a voltage rise, the sudden load thrown on the traction motor when its armature voltage is high may cause a flash-over at the commutator. Also, the braking torque is applied when the motor regenerated voltage is near its maximum; the retarding action is therefore a maximum at its initial application, causing fierce braking.

The British Thomson-Houston Co. has introduced a new method of inserting a loading resistance within a few milliseconds. An excess bus-bar voltage is detected by a grid-controlled rectifier (a standard B.T.H. Thyratron) indicated by T in the schematic diagram. The Thyratron grid potential comprises two components, one being a portion of the DC bus-bar voltage derived from the potential divider A B, which tends to make the grid positive, and the other a constant negative component obtained from the rectifier R, and this, being normally somewhat greater than the first component, holds the Thyratron in a non-conducting state.

A rise in line voltage of, say, 30 or 40 V, makes the Thyratron grid sufficiently positive to enable the Thyratron arc to strike. Current therefore passes through the main loading resistance L_1, and Thyratron T, to the permanently immersed ignitor of the Ignitron I. This immediately initiates the hot spot in the mercury pool of the Ignitron and an arc strikes between the pool and anode.

The resistance L_1, which is thus brought across the bus-bars, can carry at normal line voltage more than the maximum regenerated current likely to be experienced. Hence the main rectifier continues firing during the regenerative period and the bus-bar voltage is held at its normal value.

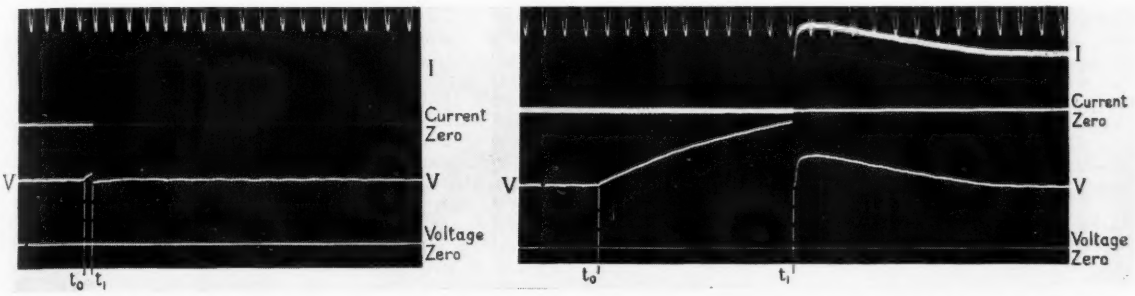
A contactor C_1 is energised at the same time as resistance L_1. Hence the Ignitron is short-circuited soon after it has performed the preliminary function of inserting the loading-resistance. This arrangement not only relieves the Ignitron of load, but in being extinguished the Ignitron arc performs the resting operation necessary when an arc is fed with DC.

Auxiliary contacts on contactor C_1 close contactor C_2 inserting a "no load" resistance L_2, which is capable of passing enough current (about 20 A) to load the main rectifier beyond its transition point (assuming an interphase transformer to be used). When C_1 closes, an auxiliary normally closed contact (in series with a relay coil C_3) opens; C_3 is now under the control of relay D_1, and the latter opens when the regenerated current falls to zero. C_3 is then de-energised, and its contacts cause C_1 to open.

When contactor C_1 opens, contactor C_2 remains closed, but is now under the control of relay D_2. This relay is operated by directional-current device D and is de-energised when a forward current greater than about 25 A is taken by the feeders. Contactor C_2 then opens, removing the no-load resistance. The "reset" time of the equipment is negligible because as soon as the arc caused by the current through resistance L_1 is broken by contactor C_1, the Ignitron can refire to prevent build-up of voltage.

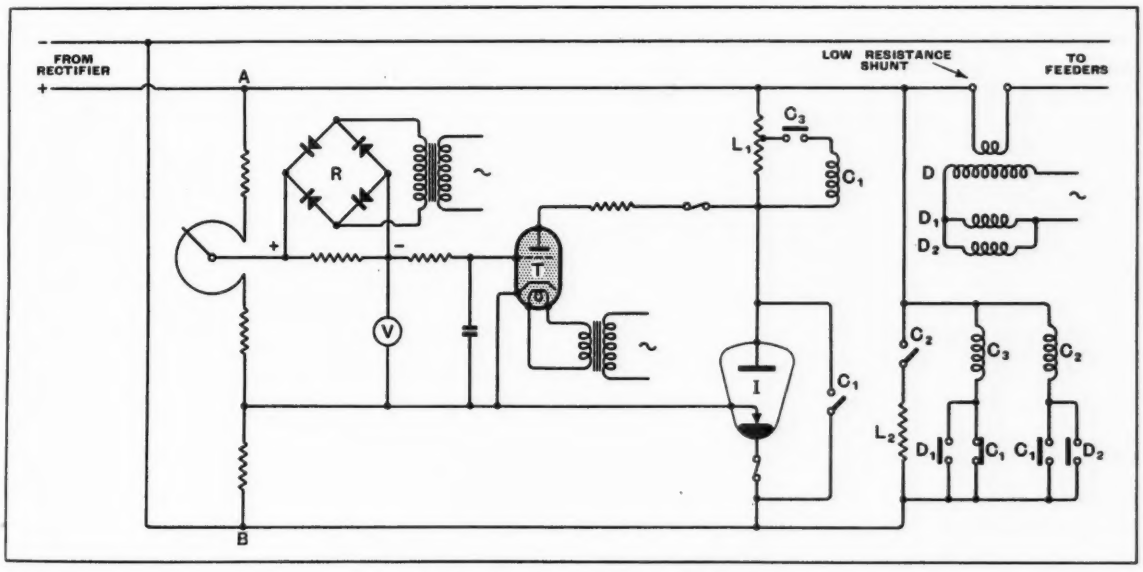
The Ignitron panel requires the same space as a contactor-operated loading panel of the same rating, and can be made to line-up with other control panels.

The oscillogram showing the rise of bus-bar voltage (V)



Oscillograms showing conditions prevailing during regeneration with Ignitron (left) and contactor loading (right)

50-cycle timing wave at top. V, traction bus-bar voltage. I, current through loading resistance. t_0, time of commencement of regeneration. t_1 (Ignitron oscillogram), time of commencement of conduction of Ignitron. t_1' (contactor oscillogram), time of closure of main loading contactor.



Key diagram of Ignitron loading equipment

Pulverised Fuel Firing.

By V. Walker, A.M.I.E.E.

Some recent developments

A MARKED trend towards the use of pulverised fuel in the United States is indicated by a recent report of the Prime Movers Committee. This may be primarily due to the installation of the equipment constructed in 1936-37 in existing power stations, especially in connection with high-pressure superimposed plant.

Pulverised fuel furnaces occupy less floor area than do stokers, since furnace volume is the controlling element and, for a given area, may be enlarged by increasing the furnace height. Stokers need a large flat area and in very large sizes double-ended units may be required, with further space for the duplication of coal bunkers and firing aisles.

An essential requirement of pulverised-fuel installations is quick response to changes in load over a wide range of output. The bin system with its reservoir of prepared fuel has in the past been considered particularly suitable for these conditions, but this advantage is being offset by providing pulverisers with feeders of liberal capacity and by recent developments of direct-fired equipment. A major difficulty with direct firing is the effect of moisture on the operation of the raw-coal feeders. Recourse has been made to direct gravity by-pass around feeders of the disc type for emergency use to provide excess capacity and close co-ordination of raw-coal feed to primary air.

With the type of mill feeder in which coal entering at the top drops on to a revolving table and is carried through an arc of 150 deg., being then discharged from the side of the housing, difficulty occurs when the table wears at the edges, causing dry coal to continue to run after the table has stopped revolving, thus overloading the mill. With very wet coal it is often difficult to get a sufficient quantity into the mill due to its bridging over the feeder table or building up on the scraper bar.

Raw-coal bins should preferably be of the self-cleaning type, so designed that the fuel does not hang up in the openings or grates, even under unfavourable conditions of moisture and sizing. Sloping the bottom surfaces a minimum of 60 deg. to keep the valley angles steeper than 48 deg., and making an outlet of 18 in. sq., accomplishes this. Bin gates are generally provided in order that the succeeding parts of the system may be quickly freed of coal. "Clam-shell" bin gates with dust-tight housings are arranged to suit the opening in the bin and fuel spout to the feeder. Flexible connections designed to prevent the transmission of vibrations from the pulveriser to the remainder of the system, are inserted to the spout from the feeder to the mill.

The effect of moisture on mill capacity is shown by the following figures taken from tests on a Hardinge conical ball mill rated at 6 tons per hr., 8 tons per hr. with 4 per cent. moisture, 7 tons with 8 per cent., 6 tons with 10 per cent. and 4 tons with 11.7 per cent. Power consumption was practically constant regardless of moisture, so that the power per ton is inversely proportional to mill output.

Mill output is varied either by changing the air flow through the mill or by changing the feeder speed. When output is varied by changing the air flow through the mill the effect of moisture on mill capacity is serious, unless sufficient primary air is used to dry the coal in the mill which will not be carried out of the mill with the air until all surface moisture has been removed. Tests indicate that under extreme conditions coal leaves the mill with a moisture content equal to the inherent moisture of the coal. Normal capacity has been maintained by increasing the temperature of the preheated air when dealing with coal difficult to deliver to the pulveriser.

Output is also affected by ease of grinding. The coal fed to the mill should be uniform in size, and sizes over 1 in. should be avoided. The fineness of pulverisation should increase with the fixed carbon of the coal. For high volatile coals about 65 per cent. and preferably 70 per cent. should pass through a 200 mesh; with anthracite about 90 per cent. Coal remaining on a 50 mesh screen should not constitute more than 1 per cent.

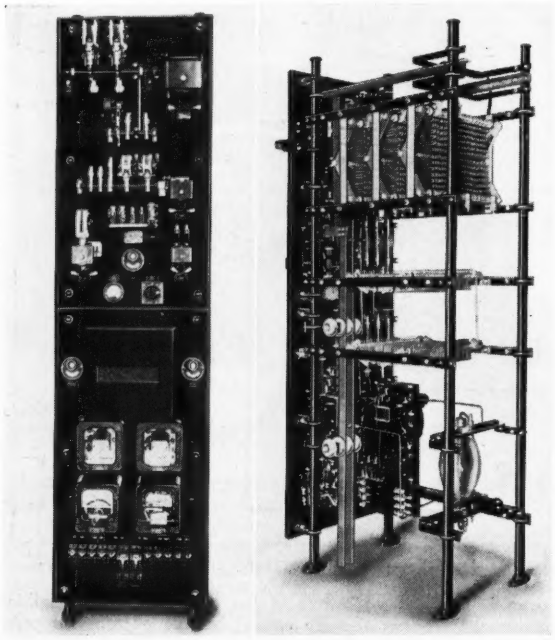
One of the fundamental requirements of a pulveriser for direct firing is a co-ordinated control of fuel and air inputs. Such control is necessary for proper fineness, quick response and range in output. Results of tests taken to determine the speed of response to load changes are illustrated in fig. 1. To increase the steam flow by 176,000 lb. per hr. (from 100,000 to 276,000 lb. per hr.) required 8 min. with hand control and with feeder control 2.9 min. Fig. 2 shows the pulveriser feeder control and its relation to the pulveriser and primary air flow.

At minimum output a comparatively low level of coal is

Bus-bar Loading for Traction Sub-stations

(Continued from preceding page)

under Ignitron control relates to the same rate of regenerative braking applied to the same traction motor when the Thyratron control voltage was set to start "firing" if the DC bus-bar voltage exceeded normal by about 30 V. The regenerated voltage was allowed to build up for only 0.004 sec. after this set voltage had been reached; the maximum excess voltage was only about 50.



Ignitron loading panel and (right) rear view showing Ignitron and loading resistances

Surges of about twice normal line voltage are sometimes experienced due to the opening of inductive circuits such as shunt fields. A relatively low impedance path is provided across the traction bus-bars to suppress such surges by the firing of the Thyratron alone within about 1 milli-second after their initiation.

The standard B.T.H. Ignitron has a maximum short-time rating of 2,500 A, which is well beyond normal requirements for this type of service. It can be used on DC traction systems up to 3,000 V. For average conditions of trolley-bus service a main loading resistance having a short-time rating of 200 to 300 A is suitable. When much greater regenerative loads have to be absorbed, it may be preferable to insert the loading resistance in two steps, the second resistance being closed by a second Ignitron only if another voltage rise is detected after the first Ignitron has fired.

Smoke Abatement

SPEAKING in London recently Mr. C. S. Shapley (engineer and general manager, City of Leeds Gas Department) complained that the Smoke Abatement Society was badly supported by the electricity and gas industries. The public did not realise that England, as a whole, was the filthiest country in the world. Household and office fires contributed 80 per cent. to the smoke in the atmosphere, and Government offices in Whitehall were bad offenders. The Office of Works spent £120,000 per annum on cleaning and renewals in public buildings, whilst some £2 millions was spent annually entirely due to smoke. Electricity and gas for continuous heating were too dear, but if universally used would become low enough in price to be within the means of all, just as radio had become. When it had been proposed to establish a "smokeless area" in Manchester the coal industry had declared that this would probably result in a loss which would necessitate an increase in the price of coal to individual consumers of 3s. per ton, but actually, he said, more coal would be required than at present. The speaker concluded by suggesting that the Government should commence by legislation to abolish the use of coal in all offices and in houses above a certain rateable value.

required around the grinding balls, while at maximum output the upper grinding ring is practically covered. This variable reservoir of coal affords not only a basis for the functioning of the control but also provides an adequate storage. At any given coal level the differential pressure across the pulveriser (H_2) will vary with the differential pressure (H_1) across a fixed orifice in the air inlet to the pulveriser. As the coal level varies the ratio between H_1 and H_2 changes, and these fluctuations are utilised to actuate diaphragms linked to electrical contacts that control the feeder motor.

To vary the feed to the pulveriser the amount of primary air flowing through it must be changed either manually or automatically; the air flow, in turn, being governed by the load. Changes in air flow are reflected in H_1 and H_2, and consequently control the level in the pulveriser, starting the mill when the coal has been reduced to 1,000 lb., and stopping the feed when the charge in the mill has reached 1,500 lb. The speed of response of the mill is practically immediate because the coal feed is varied in synchronism with the air flow. Some pulverisers have a delay in mill response of between 30 sec. to 2 min. The lag in boiler response will, however, be greater than this, due to the additional lag introduced by the evaporative system.

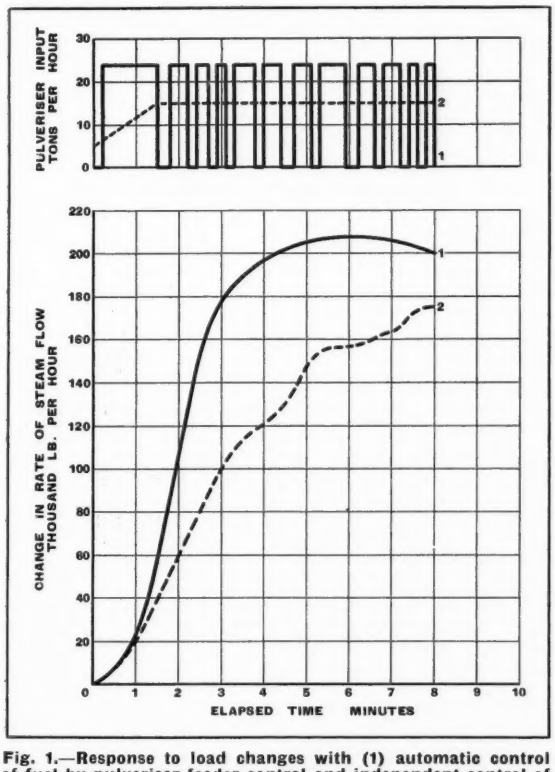


Fig. 1.—Response to load changes with (1) automatic control of fuel by pulveriser feeder control and independent control of primary air; and (2) independent manual control of primary air and fuel feed to pulveriser. The load is increased similarly in both tests, the boiler operating initially at 100,000 lb. of steam per hr.

Pulverisers may be installed either on the pressure or suction system. In the bin system the fan may handle clean air with the pulveriser under suction because of the separator between the pulveriser and exhauster fan; with a direct-fired suction system, however, the fan or exhauster must handle coal-laden air. One of the advantages of the pressure system for direct firing is that the primary fan handles clean air, thus eliminating the trouble due to unbalance of exhauster blades due to wear.

It has been standard practice in the past with Hardinge conical ball mills to introduce air at one end of the mill, and to remove the pulverised fuel at the other. Mills are now being constructed to introduce air and remove pulverised fuel at both ends of the mill simultaneously, raw coal being fed to the mill at one end only. Preheated air is introduced at both ends of the mill through sleeves supported at the centre of hollow trunnions. Air and pulverised fuel leave the mill at each end through the annular spaces between the sleeves and walls of the hollow trunnions. A special classifier is fitted at each end of the mill, the oversize particles of coal being rejected to the bottom of the classifier and returned to the pulveriser.

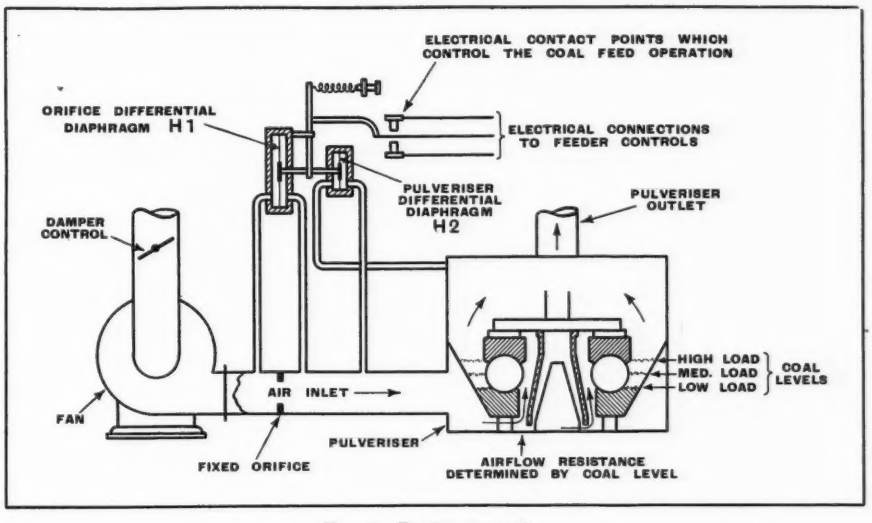


Fig. 2.—Feeder control

Maintenance costs for pulverisers vary over wide limits, being as high as 7 cents per ton with mills installed prior to 1930, and as low as 1.3 cents for others of later design. The principle source of outage appears to be mill-exhauster fans, especially where they deal with coal-laden air. Worn spiders and exposed parts of fan blades have been restored with acetylene brazing. Fan blades of ⅜ in. soft steel plate require replacement after handling from 25-30,000 tons of coal.

In some types of mill the fineness is not affected by changes in output, while in others it decreases as output increases. Fineness also changes with mill wear and with moisture, according to the type of mill and amount of primary air.

Preventing Corrosion and Erosion

Corrosion of exhauster-fan blades, liners and of collectors and piping is attributed in some cases to condensation after shut down. Protective coatings applied to exhauster wheels have arrested corrosion for a short time; these, however, fail by erosion in too short a time to warrant re-coating. Exhausters which have been sand-blasted and lead-sprayed fail from this type of wear within a year. Stainless steel blades of 12-14 chrome are now in service and favourable results are anticipated.

The cleaning of pulverised fuel bins calls for caution to avoid fires. Difficulty in cleaning often occurs with moist pulverised coal hanging in concrete bunkers. A lining of 2-in. rock-wool cement, reinforced with chicken wire anchored to the inside face of the concrete, has practically eliminated hand cleaning of the bunkers, and is in excellent condition after six years' service.

Fires are smothered by closing bunker vents and discharging the coal into the furnace before filling the bunker with fresh coal. Fires are often caused in burners by coal lodging in the piping and burner casing, especially when the burner has been out of service for some time. Compressed air is used to blow out any accumulated coal dust by fitting plugs in the burners and piping.

Rumanian Electrical Appliance Imports

THE importation of electrical appliances into Rumania has been developing rapidly during the past few years in spite of the growth of an appliance industry within the country. In 1935 imports of appliances (except electric irons) amounted to 47,713 kg. By 1936 this figure had already risen to 69,061 kg., which was almost equalled by imports for the first six months of 1937 (66,369 kg.). Complete figures for 1937 will probably be at least double those for 1936. Imports of electric irons rose from 6,870 kg. in 1935 to 8,323 kg. in 1936, while in the first six months of 1937 a total of 7,269 kg. was imported. The chief suppliers of electrical appliances were Germany and the United States.

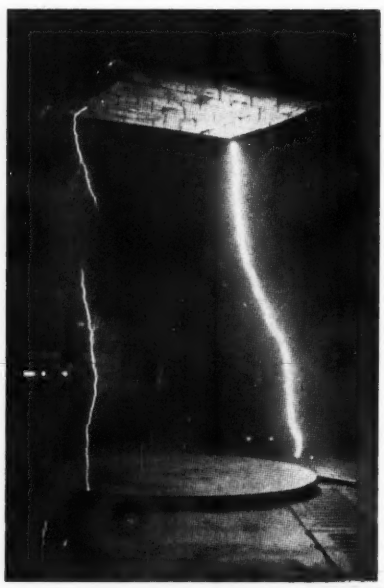
Meetings and Discussions

Yesterday Dr. T. E. Allibone's interesting paper on the mechanism of long sparks was discussed by the I.E.E. in London. At the North-Eastern Centre last week Mr. F. A. Orchard surveyed the growth of the fifty-year-old Newcastle and District Electric Lighting Co., and among other meetings of electrical interest during the past week was one at West Bromwich where Mr. E. W. Ashcroft spoke to the local Manufacturers' Association on the advantages of electrification of suitable main-line railways

Long Sparks

STUDY of the mechanism of electric sparks has been mainly confined to short sparks and natural lightning flashes. More recently Dr. T. E. Allibone (Metropolitan-Vickers Electrical Co., Ltd.) has been investigating the characteristics of long sparks of the impulse-voltage variety between a point electrode and earth. Some of his conclusions are set out in a paper that was awarded the Coopers Hill War Memorial prize and published in the *I.E.E. Journal* in May last. This paper, with a demonstration of apparatus, was discussed last evening (November 3rd) at the INSTITUTION OF ELECTRICAL ENGINEERS in London.

The author's object has been to determine the chronological sequence of discharge processes, with the aid of stationary and rotating cameras and cathode-ray oscillographs. Discharges preceding the main spark were observed, irrespective of the polarity of the high-voltage electrode, the separation in time of the pre-discharge manifestation from the main spark being almost equal to the time-to-sparkover as recorded by the cathode-ray oscillograph. These discharges have been studied in air at atmospheric and lower pressures, and it has been shown that the pre-discharge is a "leader stroke" in the strict sense of the word as applied to the lightning discharge: a "leader" blazes an ionised path from the high-voltage electrode (of either polarity) to earth and is then followed by the return, or main, stroke of the spark from earth to the high-voltage electrode. Under certain conditions leader strokes develop from both electrodes simultaneously. The leader stroke always exhibits branching in the direction of propagation; the main stroke follows some of the more important branches, but does not develop fresh branches. The direction of branching of the spark discharge is the criterion for the direction of propagation of the leader stroke.



Sparkover from extensive pointed high-voltage negative electrode to earthed electrode. Note the upward and downward branched streamers to left of main spark. The earthed electrode has many points of high local stress from which upward branched streamers develop

No change was observed in the character of the discharge which could be ascribed to a changing composition of the air within an enclosure surrounding the spark, but more careful experiments in different gases are being performed.

Results obtained at pressures down to one-fifth atmosphere cannot be compared with other records, as no rotating-camera photographs of low-pressure discharges have (to the author's knowledge) been previously taken. The suggestion that, at low pressures, electron avalanches no longer suffice for building up space charge seems to be borne out by the fact that no true leader formation is apparent until pressures of 6-20 cm. for a 30-in. electrode gap are attained. This also explains qualitatively why the time-lags are so long, compared with those at atmospheric pressure, but no quantitative explanation can yet be offered.

With both electrodes pointed there is evidence that the anode leader starts some time after the start of the cathode leader. At present, therefore, it would appear that negative discharges do not necessarily propagate themselves more rapidly than positive discharges, but that shorter time-lags with negative point electrode may be due to the simultaneous growth of streamers.

From positive point electrode to plane earthed cathode leader strokes are of a simple nature. From negative point electrode to plane earthed anode the cathode leader is met by a rising anode leader—at least under all circuit conditions so far examined—and if points project from the plane electrode then the anode leader from these points is always present. The speed of the leader development can be controlled by variation of circuit constants, and since in the lightning flash the charge has to be collected from the raindrops or ice particles in the cloud, the "resistance" within the cloud may be expected to vary over a wide range; this alone would appear to result in a variation of speed of leader propagation, exactly as found in the laboratory experiments described above.

Velocities of leader-stroke propagation are lower than those encountered in the lightning discharge, but further research will be directed to afford a better understanding of the leader-stroke mechanism.

Long Spark Characteristics
Newcastle Supply
Railway Electrification Urged

Progress at Newcastle

THE development of a pioneer undertaking, namely, the Newcastle and District Electric Lighting Co., Ltd., was the subject of the inaugural address of Mr. F. A. Orchard as chairman of the North-Eastern Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Newcastle on October 24th.

He explained that this company, which was fifty years old, was to-day rendering efficient service to 23,700 consumers and generated at least 90 per cent. of its distributed output at peak periods, yet gave steady and remunerative dividends to its shareholders.

The concern was actually brought into existence by the Hon. C. A. Parsons (later Sir Charles) who made its power station an experimental ground for the development of his steam turbines. It was registered as a limited company in January, 1889, and commenced operations under a provisional order granted by the Board of Trade dated July, 1891. The records of long service of its officials and staff were unique; quite a large proportion had spent practically the whole of their working lives in the employ of the company.

Mr. Orchard delineated the progress of the various sections of the undertaking, commencing with the power stations in chronological order. The initial plant consisted of Lancashire boilers and 150-kW turbo-alternators, some of the radial-flow design, since Clark, Chapman & Co. held the axial-flow patents. One of the first single-phase sets was designed by Parsons to run as an AC or DC machine by changing its armature. The DC station established in 1904 ceased to generate in 1919 and is now a sub-station supplying the Corporation tramways through rotary convertors and motor generators. In 1908 a waste heat station was inaugurated, using turbo-generators driven by steam exhausted from the reciprocating engines driving the rolling mill in the steelworks of John Spencer & Son, Ltd., which rolling mill was closed down in 1924; this station has been dismantled.

In 1915 the generation of three-phase, 40-cycle power was undertaken at 6,000 V. A rotary convertor and 40/80-cycle frequency changer were used to interconnect the networks, since replaced by invertible rotary convertors.

The early system was single-phase, 80 cycles, generated and transmitted at 1,000 V and stepped down to 100 V at consumers' premises or to 250 V at one or two sub-stations. The transmission system consisted of single conductor rubber-covered cables drawn into iron pipes, and the service branches to these cables were made in underground street boxes spaced at frequent intervals, by spliced and vulcanised joints on to the main cable. On the 1,000-V system were air-break switches at the power station, and the protection at this point and on consumers' premises was by various types of fuses.

The 480-V DC system, which was extensively laid throughout the city area, consisted of rubber and also paper and bitumen insulated single conductor cables laid in earthenware troughs as well as cast-iron troughs, the troughs being filled in with bitumen. In some instances replacements had been made by using four-core cables with the conductors bunched in parallel so as to give the required capacity, and to be available as low-voltage AC distributor cable in the future.

The control of the DC cable system was by means of underground street boxes equipped with stud contacts. In

later years a number of these had been replaced by overground street pillars containing links and fuses. One of the two principal rotary convertor sub-stations was made soundproof, and could run as a more or less hermetically sealed chamber with air drawn through ducts to the rotaries and their transformers by electrically driven fans, but as there was very little noise this feature had very seldom been brought into use.

Although the normal policy was to minimise connections to the DC system, in view of the extensive mains, the capital expended thereon and the high cost of changing consumers' plant, the company's policy, at the moment, was to retain the DC system and, where necessary, to extend in a manner that allowed for a change-over to AC later.

The AC 6,000-V distribution comprised a ring main and spur feeders. The supply was transmitted to thirty-four static and five rotary sub-stations; two of the former were of the outdoor type and the remainder of the indoor type. In the majority of sub-stations transformers were installed outdoors. The 6,000-V overhead lines were limited to 1¾ miles.

The change-over of the company's 40-cycle system to 50 cycles at a cost of £136,782, and affecting some 13,500 consumers, was a gradual process prior to the initial connection of the company's system to the grid, when the whole of the company's AC generating plant was closed down.

Some 27,000 house-service meters were now in use, the number of AC consumers was 20,350 and of DC 3,350. The lengths of mains in use were 19 miles of 1,000 V at 80 cycles, 32 miles of DC at 480 V, 40 miles of AC at 6,000 V, and 143 miles of AC at 440 V.

"Civils" Presidential Address

THE science of engineering in ancient times was chosen by Mr. W. J. E. Binnie as the subject of his presidential address to the INSTITUTION OF CIVIL ENGINEERS in London on November 1st.

Commencing with some of the tools employed by the Egyptians at least 5,000 years ago, Mr. Binnie discussed methods and contrivances in use down to the Græco-Roman period, after which, he said, retrogression set in and it was not till the renaissance in the latter part of the fifteenth century that any advance was made.

A portion of the address was concerned with water supply, a subject to which most of the president's career has been devoted, and containing information about the numerous aqueducts that supplied water to the city of Rome, totalling 263 miles, of which 35.5 miles were carried on arches.

Main Line Electrification

IN the course of a lecture before the WEST BROMWICH AND DISTRICT MANUFACTURERS' ASSOCIATION at West Bromwich on October 26th Mr. E. W. Ashcroft referred to the desirability of resuming capital expenditure on the railways for the sake of railway efficiency and to maintain employment in the iron and steel and engineering industries. He said that only 35 or 40 per cent. of capital expenditure on railway electrification schemes went to the electrical manufacturing industry.

The electrification of suitable main line railways, such as the L.M.S. route to Birmingham, was the most certain method by which the railway companies could win back heavy traffic from the roads. Further schemes of electrification, like the Manchester-Sheffield L.N.E.R. route, would be put forward with freight traffic in mind quite as much as passenger traffic. In Sweden, for instance, the long-distance electrification between Stockholm and Malmö and Gothenburg had cut off two hours on an eight-hour journey for fast freight trains, as well as providing a greater frequency of services.

The electrification of suburban lines such as the Snow Hill (G.W.R.) route to Stratford-on-Avon and the Knutsford loop were obviously favourable propositions in themselves but there would be great difficulty in handling the increased traffic at the Birmingham stations, particularly New Street. Were sections of the main line electrified first, this obstacle to extensive suburban electrification in the Birmingham-Wolverhampton area would disappear. This applied particularly to the L.M.S. route between New Street and Wolverhampton.

The railway companies would clearly be able to regain a great deal of passenger traffic in the Black Country were schemes of electrification carried out. More travellers carried by rail in the Birmingham area would mean a decrease in the number of public service vehicles on the roads and consequent relief of traffic congestion. The coal industry has nothing to fear from the gradual progress of main-line electrification. Rapidly increasing consumption of electricity would follow not only as a result of the increased demands for power from the railways, but also as a consequence of lowered electricity tariffs to the consumer.

The vulnerability of electrified railways to air attack was clearly not believed by the German authorities who were rapidly extending electrification in South Germany and in Austria. Repairs to electrical equipment could be quickly carried out and were as easy as track repairs. The existence of the grid with its pooled supplies would mean that even extensive damage to several power stations would not affect supply to a railway.

The extent of European electrification had increased rapidly since 1932. A through electrified route from Berlin to Naples would be opened as soon as the Berlin electrified tracks were linked with the Halle and Leipzig systems. In France, the Paris-Tours-Bordeaux-Spanish frontier route had been completed. In Scandinavia, Sweden had nearly 60 per cent. of all railway tracks electrified, carrying over 80 per cent. of all railway traffic in the country. Norway was also pushing ahead with electrification, partly as a result of fear of European war and consequent coal shortage. Railway electrification in the Dominions was still being carried out. The latest scheme was that of the New South Wales Government which was electrifying three main routes out of Sydney in connection with a State scheme of power development.

Engineering Training

THE first informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS, 1938-39 session, took place in London on October 24th. The president, Dr. A. P. M. Fleming, opened the discussion on "Engineering Training in Relation to Present Conditions" and advocated post-advanced courses for staff juniors. Post-graduate schools for engineers were needed with a drift from industry to the university, not merely the one-way drift in the opposite direction. He thought that the time had arrived for still more effort and he hoped to see progressive co-operation on the whole industrial front. Firms of limited scope might be able to draw upon the resources of bigger firms with advantage.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 10th. Institution, London, W.C.2. 6 p.m. Ordinary meeting. "Thermal Power Plants for Peak Load and Emergency Service," by Mr. H. S. Hvistendahl.

Meter and Instrument Section.—Friday, November 4th. Institution, London, W.C.2. 7 p.m. Chairman's inaugural address by Capt. B. S. Cohen. "Protective Devices for Telecommunication Purposes."

Informal Meeting.—Monday, November 7th. Institution, London, W.C.2. 7 p.m. Discussion on "To What Extent is Hydro-Electric Enterprise Economically Justified?" To be opened by Lieut.-Comdr. R. B. Fairthorne.

Transmission Section.—Wednesday, November 9th. Institution, London, W.C.2. 6 p.m. Chairman's inaugural address by Mr. S. R. Siviour.

Mersey and North Wales (Liverpool) Centre.—Monday, November 7th. The University, Liverpool. 7 p.m. "Recent Progress in Power Rectifiers and their Applications," by Mr. W. G. Thompson.

South Midland Centre.—Monday, November 7th. James Watt Memorial Institute, Great Charles Street, Birmingham. 7 p.m. "The Lighting Load—Its Characteristics and Development," by Mr. W. J. Jones.

Western Centre.—Monday, November 7th. South Wales Institute of Engineers, Cardiff, 6 p.m. "Thermal Power Plants for Peak Load and Emergency Service," by Mr. H. S. Hvistendahl.

Scottish Centre.—Tuesday, November 8th. 39, Elmbank Crescent, Glasgow, C.2. 7.30 p.m. "Centralised Control by Superimposed Ripples," by Mr. H. Purslove Barker.

North Midland Centre.—Wednesday, November 9th. Hotel Metropole, Leeds. 7 p.m. "Thermal Power Plants for Peak Load and Emergency Service," by Mr. H. S. Hvistendahl.

Hampshire Sub-Centre.—Wednesday, November 9th. Municipal College, Portsmouth. 7.30 p.m. "The Design of Domestic Electric Cookers," by Mr. O. W. Humphreys.

Dundee Sub-Centre.—Thursday, November 10th. University College, Dundee. 7.30 p.m. "Television," by Mr. G. Parr.

Association of Mining Electrical Engineers (*West Wales Branch*).—Saturday, November 5th. "The Colliery Earthing System," by Mr. E. Powell.

North of England Branch.—Saturday, November 12th. "Intrinsically Safe Circuits," by Mr. H. E. Collins.

West of Scotland Branch.—Saturday, November 12th. Royal Technical College, Glasgow. "Small Electrostatic Condensers," by Mr. R. Wilson.

Institution of Mechanical Engineers.—Friday, November 4th. Storey's Gate, Westminster, S.W.1. 6 p.m. Thomas Hawksley lecture, "The Development of Television," by Sir Noel Ashbridge.

Illuminating Engineering Society.—Tuesday, November 8th. Institution of Mechanical Engineers, Storey's Gate, S.W.1. 7 p.m. "The Revealing Power of Street Lighting Installations," by Messrs. C. Dunbar, F. C. Smith and J. M. Waldram.

Batti-Wallahs' Society.—Tuesday, November 8th. Hotel Victoria, Northumberland Avenue, W.C.2. 12.30 p.m. Luncheon.

Leeds Electrical Club.—Wednesday, November 9th. Victory Hotel, Leeds. 7.30 p.m. Annual dinner and dance.

Diesel Engine Users' Association.—Wednesday, November 9th. Caxton Hall, Westminster, S.W.1. 4.45 p.m. "Diesel Engines and the World's Fuel Supply," by Messrs. J. J. Broeze and J. O. Hinze.

Junior Institution of Engineers.—Friday, November 11th. 32, Victoria Street, S.W.1. Annual general meeting.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Motor or Trolley-buses?

I HAVE read with great interest Mr. W. J. Williams's letter of October 8th regarding the transport position in Port-of-Spain. There are, as Mr. Williams seems to realise, additional advantages for the trolley-bus other than that of mere operating costs or the using of coal instead of oil as is shown in the position in Penang.

The capital costs of trolley-buses are, of course, and must be, higher than those for oil buses in view of the fact that the major part of the cost of a vehicle is the body and chassis, and, in addition, of course, the trolley-bus has the further capital cost of the overhead wires. The present costs are roughly £2,000 for a complete oil vehicle, including bodywork, and £2,000 for a trolley-bus, including bodywork, with the additional cost of some £2,800 per mile for overhead lines. This need not deter an operator from going ahead with trolley-buses since, as Mr. Williams says, "the electric motor is kinder to the chassis in every way," with the result that the chassis and bodies last considerably longer when they are electrically operated than when they are Diesel engine operated, and this is reflected in the annual costs for maintenance and depreciation of the vehicles.

The Ministry of Transport in this country requires that loans for petrol and oil buses shall be for a period not exceeding eight years, whereas trolley-bus loans are granted for a period of ten years; loans for overhead lines can generally be written off over a period of twenty years. Therefore, notwithstanding the increased capital costs the annual charges for a trolley-bus system are of the same order as those for a motor-bus system.

Passengers invariably prefer trolley-buses to motor-buses, and in London where trolley-buses and oil-buses are operating on the same routes, passengers will wait for the trolley-bus. If Mr. Williams introduces trolley-buses into Port-of-Spain neither he nor the users will regret it. J. STEELE.

London, W.C.2, *October 28th.*

Trade Discount Questions

Ridiculous methods are adopted by some manufacturers of electrical appliances and components in charging for goods supplied to their buyers. In a particular batch of invoices I recently checked I found several items where five or six separate percentages had either to be added or deducted before the actual amount rendered could be agreed.

One particular percentage added to the price of most types of component supplied is that due to increased cost of production, owing, we are told, to shortage of raw material (with a correspondingly higher initial price). Such increases (in most cases 5 or 10 per cent.), we were informed, originally were a purely temporary measure, but they have been in force now for nearly two years. Would it not simplify matters if all manufacturers issued new price lists with amended figures?

Another reason for such a really enormous number of percentages to be deducted is that goods are often supplied by manufacturers, in the first instance, to factors, who again sell direct to wholesale firms, or electricity supply authorities, and these last two parties sell, in some cases, to retailers, and thence to the eventual consumer. Apart from the question of selling policy, surely it would be possible for a manufacturer to fix first his retail prices, then his selling prices in net terms to the factor, the wholesaler and the retailer.

A further point which has always puzzled a great number of people is why electricity supply authorities, even the smallest, should be able to obtain appliances and components on much better terms than, say, an electrical wiring contractor. If it is a matter of quantity, well and good; it is only logical. Let manufacturers fix their net selling prices to the various people concerned according to quantity purchased, but I know of numerous instances where a wiring contractor, taking three or four times the number of appliances and components than some of the smaller supply authorities, does not obtain the same preferential treatment.

Then there is the 2½ per cent. discount for cash settlement which most manufacturers allow. The idea is obviously to ensure prompt payment of accounts, but surely the discount is allowed for in the selling price of the article concerned (if it is not it is bad business) so the firm having the "benefit" of this discount is really gaining nothing. With the larger items, such as transformers, engineering material generally, &c., the very things which should be paid for without undue delay, no such settlement discount is allowed.

Long Preston, Yorks, *October 27th.* JAMES HINDMAN.

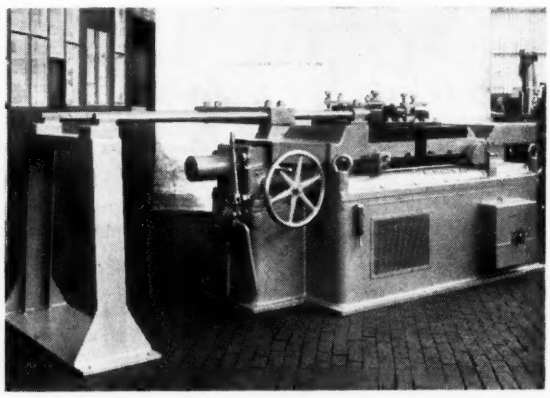
Here and There

By Nomad

AT the luncheon in connection with the recent inauguration of the Clarence Dock power station, Liverpool, I sat next to Mr. E. L. Morland, distribution engineer at Liverpool and chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E. He told me about the new distribution scheme at Prescot which is now nearing completion and the story is particularly interesting in that the procedure is a reversal of the usual order of things and suggests, it seems to me, something of an anticipation of what is likely to happen in many places as a result of the promised distribution legislation. After strengthening up the old system the Liverpool undertaking fed into the local system from the outlying districts and has since been gradually working in from the outside to the "heart of things," so that there will be soon a practically new local distribution scheme.

* * *

The Prescot undertaking was formerly owned by British Insulated Cables, Ltd., whose works in the same town I visited recently. The electrical fittings department in this works is now undergoing considerable alteration and expansion and the new shop for the production of resistance welders



One of the large butt welders seen at the B.I. works; 200 kW for 12 sq. in. section mild steel

and magnetic moulding machines is already in full production. Several large butt welders have been produced and Mr. MacPhail has since told me that one with a capacity of 350 kW for welding pipes, H girders and rails is now on its way to Iran.

* * *

Among other new works and works extensions I have seen of late is the new works at Luton of L. Weekes (Luton), Ltd., where, I must confess, I had a rather serious misapprehension corrected. The Weekes watertight plug has during the last few years become a somewhat familiar sight to me at such places as docks and shipyards and I had somehow got the idea that the growth of the Weekes organisation had been largely the result of the success of the plug. But Mr. Wilkinson, works manager, told me that the plug was born only about ten years ago as the result of a more or less chance request, and I could see for myself that the manufacture of the plug is far from being the mainstay of the concern. These facts do not alter my high opinion of the plug all the same.

* * *

Talking of shipyards reminds me of something interesting I heard recently at the shipyard at Middlesbrough of Smith's Dock Co., Ltd. Heavy c.t.s. cables have been used for a long time for both trailing work about the yard and as "fixtures" in the sub-stations. Mr. Humphreys, electrical engineer, told me that he had noticed that whereas the sheaths of trailers remained pliable those of the stationary cables had shown a tendency to hardening and cracking. He had, however, overcome this difficulty by subjecting the cables to occasional knocks or even kicks "putting life into them," as he put it.

* * *

About 1921 I was personally concerned with an experiment in the use of c.t.s. cable. I was given the job of cabling some housing estates. We laid c.t.s. direct in the soil (sandy) merely with inverted earthenware troughs for protection. Mr. A. J. Hastings, deputy borough electrical engineer, Great Yarmouth, told me recently that the cables had stood up to the conditions well and that the only troubles experienced had been the result of external disturbances. I should like to learn of other unusual experiences in c.t.s. cable work.

Public Utility Regulation. By H. M. Sayers

American methods

A NOTEWORTHY book has just been published dealing with the laws and practice of the regulation of "public utilities" in the United States.* The authors are professors of Transportation and Public Utilities, Geography and Public Utilities in the University of Pennsylvania, and of Economics and Insurance in the University of Florida, and so it may be regarded as an objective study of the facts, the existing legislation, how it is applied and what it effects, with a considerable amount of critical comment and expression of opinion as to where it calls for amendment both in substance and in administration.

The general effect of the relevant clauses of the Federal Constitution dealing with the functions of government in relation to industry is to give full liberty to private business but the wording and judicial interpretation permit of governmental regulation of industries "clothed with a public interest"; what such industries are and in what circumstances they are so clothed is a matter to be decided, first, by the legislatures, second, by the Courts, if and when applications of the laws are challenged on the ground of invasion of the constitutional rights of the parties affected.

There is no closed category of industries; broad definitions have been made in judgments of the Supreme Court, but it has laid down no rules or principles of universal applicability. In general terms they are:—(1) Those carried on under a public grant of privileges; (2) certain exceptional callings recognised as public from the earliest times; and (3) businesses not public in their inception but which have risen to be such. The first class includes most of the industries with which the authors are concerned—transportation, water supply, gas and electricity supply and communication. Under the Federal Constitution these are matters within the jurisdiction of the governments of the several States. Hence each of the forty-eight States of the Union has its own legislation governing public utilities, including the powers of granting franchises to the undertakings.

The British electricity supply industry is already subject to a great measure of Government control and some people are asking for more. This review of American methods shows how the subject is regarded on the other side of the Atlantic.

There is great diversity between the laws in the various States; in some of them franchises for certain utilities can only be granted by the legislature; in others similar franchises can be granted by local authorities. Very generally certain regulatory conditions are set out in the terms of the franchise, reservation being made of the rights of customers to appeal to some authority against unfair or oppressive action and the power of such authority either spontaneously or upon complaint to require remedy for such conduct; in particular to require modification of prices and conditions of service. To-day forty-seven of the States, and the Federal District of Columbia, have Public Service Commissions. Many of them were created solely for regulating freight and passenger traffic and rates, but with the growing need for regulation of public services generally their jurisdiction has been extended to other utilities; but there is no uniformity.

Federal Government's Powers

It will be readily seen that the authors' task has been very different from that of a survey of regulation in this country. the diversity has required a comparison of the subject in what are—for the purpose—forty-eight independent sovereign states, only subject to the protection of personal rights provided by the Federal Constitution; and to the jurisdiction of Congress as regards interstate commerce. (One of the limitations of the powers of the several States is that two or more cannot enter into a compact for mutual purposes without the authority of an Act of Congress; *per contra* an Act of Congress may prescribe an agreement or compact between certain States, but it does not become effective unless and until such compact is ratified by the States concerned, *e.g.*, the Boulder Dam Act required a compact between seven States; one declined and the Act was amended to accept the concurrence of the other six.)

Until the year 1887 the Federal Government had no powers of regulation over utilities, but in that year an Act of Congress gave it powers to regulate rates and fares on steam railways in respect of interstate traffic and to set up the Interstate Commerce Commission to administer the law in that and some other respects. Later legislation applies the same principles to telegraph and radio communication. This is a recognition of the fact that while regulation is in some degree incompatible with competition, the ultimate sufferer in unrestrained competition is the public itself. Recent Federal legislation applies the Interstate Commerce regime to power transmission lines crossing State boundaries; whilst the Federal jurisdiction over navigable waters has been used to impose terms upon the use of hydraulic powers by utilities or to establish Federal hydraulic power plants, as in the cases of the Boulder Dam and the Tennessee Valley undertakings. For utilities within the boundaries of a State the early history of regulation is an evolution from judicial regulation applying the common law principle (inherited from Great Britain) of the rights of consumers to a reasonable service at a reasonable rate, up to the present condition of regulation by statutory commission empowered to deal with consumers' grievances; or to maintain a continuous supervision over the proceedings of the utilities in directions which affect the public interest.

The process of this evolution may be regarded as a lengthy contest between the two conceptions of liberty of private industry, and the right of public authority to impose limitations of that liberty upon industries "clothed with a public interest" in return for privileges granted under the wider conception of the public interest.

One of the practical differences between conditions in the U.S.A. and this country is that the right of "eminent domain" over land (inherited from the Crown rights of British law) inherent in the State is granted to public utilities in so far as is necesary for carrying out the objects of their franchise. Even a municipality has "eminent domain" over land within its area for public purposes, in virtue of the State laws defining the rights of such bodies, and may transfer that power in a utility. The utility having acquired eminent domain over specified lands, can "condemn" and take possession of the land. Some of the Public Service Commissions can give such powers for the purposes of extensions of work which the Commission has certified as of public necessity or advantage, sometimes requiring the utility to make the extensions against its own wish. Proper compensation must be paid. The question of what is proper compensation may be contested right up to the Federal Supreme Court. It is hardly necessary to emphasise the difference of procedure in the two countries. The American way is quicker except as regards the assessment of compensation, if that is contested to the extreme.

Incidentally the same clause of the Constitution (the Fourteenth Amendment) prohibits the deprivation of property without "due process of law" and has been the foundation of appeals to the Federal Courts against decisions of Public Service Commissions prescribing reductions of charges by utilities which the latter consider will prevent them earning a fair return on their capital, hence a measure of confiscation of their property. The New York Telephone appeal taken up to the Supreme Court lasted eleven years and cost the company $5,000,000 (ultimately paid by the subscribers, the authors observe) and this is not a solitary instance. But in 1934 Congress passed an Act which deprived the Federal District Courts of jurisdiction in appeals against orders of State Boards or Commissions where: (1) the order affects rates chargeable by public utilities; (2) does not affect interstate commerce; and (3) has been made after reasonable notice and hearing; and where a plain, speedy, and efficient remedy may be had at law or in equity in the Courts of the State.

Further the District Courts are required to admit the certified record of the hearing by the regulatory body instead of re-trying the case *de novo*, which greatly shortens the appeal procedure.

Constitution of Commissions

The constitution of Public Service Commissions differs widely in different States. Most consist of three members, others have from one to seven. Specific qualifications are laid down by the statute of each State—too numerous for the authors to attempt a comprehensive statement. The actual appointments are made by the governor of the State excepting that in some States the members are elected. Neither method avoids political influence in the appointments. The rapid changing of the commissioners is another defect. Between 1915 and 1929 out of 490 commissioners, 265 served four years or less, only nineteen served ten years or more, and only a minority of either appointed or elected commissioners were reappointed for a second term. These short periods of service are insufficient for members to obtain the technical and administrative know-

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* Public Utility Regulation," by G. Lloyd Wilson, Ph.D., James M. Herring, Ph.D., and Roland R. Eutsler, Ph.D. McGraw-Hill Publishing Co., Ltd. Pp. xv+571. Price 24s. net.

ledge necessary for the proper discharge of their duties. Again the legislatures do not grant sufficient means for either adequate payment or adequate staff. The authors emphasise that for the efficient discharge of their functions Commissions should have the means to investigate matters for themselves, not merely hear complaints from consumers' parties often unable to prepare and prosecute their cases properly.

Some States have enacted laws assessing against the utilities the cost of regulation; in two States these laws were held to be unconstitutional, but in others they have been sustained by the courts. The authors note that the leading States have enacted many new laws since 1930 which enlarge the powers and increase the financial resources of the Commissions. Examples of relatively good organisations are described—those of the States of Wisconsin and Pennsylvania; the former has 285 employés, the latter about 200. The Wisconsin organisation sub-divides the work of regulation by both the class of utility and the nature of regulation; *e.g.*, rates, accounts, &c., engineering, securities and services, for each class of utility under a general secretary and counsel. The Pennsylvania Commission divides its staff by function :—secretarial offices; bureaux of engineering, accounts, rates and statistics; public convenience; and law, each of them dealing with all classes of utilities.

Proposals for Improvement

The authors emphasise that the most pressing needs for better regulation of utilities are that commissioners should be selected for their competence and character; that they should be appointed for long terms, adequately paid and only removable for proved misconduct or incompetence by judicial process; that adequate staff and financial resources should be granted them; and that their functions should be supervisory and administrative involving initiative for the improvement of public services—not merely judicial. They would like to see much greater uniformity in the legislation of the various States, and record the formation of the National Association of Railroad and Utility Commissioners composed of representatives of many of the Commissions, which has made some proposals for standardisation of legislation on the subject. As this requires action by all the State legislatures, it is not likely to be achieved in a hurry, if ever.

This general historical survey and statement of the present position occupies the first three chapters, or about one-eighth of the volume. It is followed by eleven chapters on the working of regulation under such heads as :—Accounting and reporting; rate regulation; valuation; fair return; depreciation; service; security issues; holding companies; Federal Government and public utilities; and motor transport. The final chapters deal with :—Federal regulation of interstate commerce in gas and electricity; national power policy; Federal power projects; rural electrification; Federal regulation of communications; and Government ownership. The eleven chapters mentioned are mainly occupied with details of cases dealt with by the Commissions and the Courts exhibiting the general and comparing the specific trends or effects; well over 120 cases are cited and listed and it should be a valuable conspectus of the laws for American utility managers and lawyers. The later chapters show several aspects of Federal intervention in utility regulation; the recent Holding Companies Act is described but its constitutionality has not yet been decided and little action has been taken under it.

Public Ownership Appraised

The discussion of Government ownership of utilities covers municipal state and federal ownership. The authors approach the question without ideological bias, and stress the need for a consideration of the issue on its merits. Regulation of public utilities has already encroached upon the sphere of management and to that extent the utilities have been " socialised "; completion of the process is, therefore, a question of an immediate practical nature. They adopt a distinction between " standardised " and " progressive " industries which present very different types of management problems. Post Office and water supply are instances of the former. Their management is largely routine and necessity rarely arises for making radical changes of method or scrapping obsolescent plant.

The " progressive " industries, such as transportation, communication, electricity and gas supply, require more than routine performance of duties. Judgment about scrapping or about the trial of new methods and foresight over long-time results are called for. History shows government enterprises to be fairly successful in the standardised but habitually unsuccessful in the progressive industries. State ownership of various undertakings has been marked by dismal failures or at best by no marked success. On the whole State ownership of utilities is not a live issue in the United States. The immediate problem is that of municipal ownership except so far as the power projects of the Federal Government are concerned. The municipal ownership of waterworks is very general, gas very rare, street railways also rare, but the large cities, New York, San Francisco and Detroit are among the few instances of the last named.

There have been municipal electricity undertakings from the beginning; from 1882 until the end of 1935, 3,938 had been established and 2,068 had been sold or abandoned. Those now operating are more numerous than company undertakings, but the companies' output is about twenty-five times, and the number of companies' consumers about ten times those of the municipalities. Of the municipal undertakings the tendency is for those having generating stations to decrease rapidly and those purchasing energy much less rapidly. In some cases companies have offered high prices for the undertakings in order to round off their areas; companies have also used their influence to discourage municipal ownership.

There has been some increase in the number of municipal undertakings since the Public Works Administration of the Federal Government has offered financial assistance for the establishment or purchase of undertakings in the areas served by the Tennessee Valley, Boulder Dam, and other Federal Power projects. As regards the public interest aspect of municipal and company administration the authors cite comparisons made by the Federal Power Commission which collected and analysed bills for various classes of service in some 30,000 communities. The communities were grouped by populations and States; considered to be fairer bases of comparison than State-wide averages. There are great differences in the proportions of privately owned and publicly owned undertakings in the various states. On the whole, the figures show that there is much more variation in charges among municipally owned undertakings than among company-owned undertakings in the same territories; they indicate widely varying degrees of efficiency and economy. There are municipal plants that compare in efficiency with the best of private plants, and there are poorly managed ones. It is particularly noted that private plants pay heavy taxes not borne by municipal plants; on the other hand, the latter render free services and make contributions to general funds which are roughly comparable with the tax burdens of the companies. The authors emphasise that comparison of rates alone is a very incomplete assessment of the relative service of public interest. Small isolated new public plants could not begin operations at the rates charged by the old-established well-managed public plants.

Restrictions upon Municipalities

There are in most states legal restrictions upon municipal ownership which militate against the spread of the movement. In some states a certificate of public necessity and convenience from the Public Service Commission is necessary. There have been many applications to the courts to forbid the establishment of municipal electricity plants, generally in defence of the interests of companies with which the new undertakings would compete. A good many injunctions have been granted. The applications have been very numerous since the Public Works Administration commenced offering financial assistance and the Tennessee Valley Authority began offering bulk supplies to municipalities in its area.

To a British reviewer it seems a little remarkable that the favourable experience of municipal undertakings in Great Britain is not mentioned. The authors would perhaps answer that they are writing for Americans and that British conditions are not comparable with those in the U.S.A. Their own views seem to be that there is much to be said for and against municipal ownership; they set out the relevant arguments quite fairly. Their final words are that the question of public ownership is not to be solved satisfactorily by generalisations but by the consideration or individual utilities and governmental units. This applies to State and Federal ownership as well as to municipal.

They make quite clear their opinion that public ownership would be much more favourably considered if it were possible to remove the staffing of the concerns from the scope of political preferment, extending Civil Service regimes to the controlling and working personnel. One can well agree with this.

The Electrical Engineers' Ball

THE Electrical Engineers' Ball for 1939 is to be held at Grosvenor House, Park Lane, W., on Friday, February 10th, the day after the annual dinner of the Institution of Electrical Engineers. The details are being settled by the Executive Committee which is doing all it can to ensure the comfort of guests both as regards dancing and supper. Tickets will be one guinea each and will be obtainable as usual from members of the General Committee. Any surplus remaining after defraying the cost of the ball will be handed over to the I.E.E. Benevolent Fund.

New Electrical Showrooms and Offices

Tame Valley

ALD. SIR CHARLES H. BOOTH, chairman of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board, last week performed the official opening of the new offices and showrooms at the old Tame Valley generating station at Stalybridge, a description of which was published in our last issue (page 624). The reconstruction has been on an extensive scale and has been rendered necessary to allow for future developments in the demand for electrical service. The adapted building is divided into a number of sections, most of them fully equipped for meter testing, repairs to domestic appliances, distribution engineering workshops, joiners' shops, transport department, &c., apart from stores and offices.

The inauguration of the new premises was attended by electrical engineers and managers from many of the neighbouring authorities as well as by members of the four Councils that constitute the Joint Board. Councillor F. D. Ashton, chairman of the Electricity Committee, said the undertaking had developed to an extent not visualised at its inception. Nine years ago the Joint Board had only 4,000 consumers; to-day there were 25,000, and in consequence the maintenance, repair and other departments were entirely inadequate until the additional space was available in the Tame Valley station. The new meter testing department was in line with the most modern installations to be found anywhere. He paid tribute to Mr. J. Harwood Lumsden, the chief engineer, for the skill shown in designing the building for its new purposes. Sir Charles Booth remarked that in the early days of the Joint Board precepts amounting to £144,000 had been issued on the local authorities, but in the last four years they had been paid back £30,000. That indicated the progress which had been made. The growing demand for electricity, especially from householders, had made it necessary for the additional office accommodation and maintenance departments to be provided. Approximately 66 per cent. of the premises in the Joint Board's area of supply were now connected to the mains.

Watford

An impressive building to house the municipal electricity showrooms and offices has been erected by the Watford Electricity Department at The Parade and the opening ceremony was performed by the Mayor, Coun. T. Rigby Taylor, last Saturday afternoon. The public supply in Watford was commenced in June, 1899, and during the first six months 113 consumers were connected. Now Watford is a selected station and, according to Alderman H. Coates, the chairman of the Electric Lighting and Power Committee, there is a saving of over £20,000 per annum over the grid tariff.

The new three-storey building is constructed with a steel frame encased with brick walls and equipped with fire-resisting floors and a flat roof. Heating is by low-pressure hot water from an off-peak electrode boiler while air-conditioning is provided in the showroom and demonstration theatre which is situated immediately behind the showroom and has accommodation for nearly a hundred people. Film displays are to be given, a special projection room being provided in the building, and there is a raised platform for cookery and other demonstrations.

The new Watford showrooms and electricity offices

The showroom itself has large windows suitable for displays on each side of the entrance. There is a lift to all floors from the showroom and two goods lifts at the rear.

Both the heating and ventilating plant are situated in the basement which also houses the sub-station and lift gear rooms. The upper floors are devoted entirely to offices, the staff room, board room and caretaker's apartment being on the top floor.

The main contractors were G. & J. Waterman, Ltd., and the wiring was carried out by Duncan Watson & Co., Ltd., to the design of Mr. A. W. Barham, the chief electrical engineer and manager.

At the opening ceremony the first cash purchase was made by the Mayoress, the salesman being the Mayor.

London

One of the most attractive domestic appliance showrooms we have seen for some time has just been opened by Wilec, Ltd., at 90-96, City Road, London, E.C.1, the up-to-date design adopted permitting all the available space to be utilised to advantage, without giving an impression of overcrowding. On entering one is enabled, by an ingenious arrangement of slots in the curved display alcoves, to have a clear view of practically the whole of the showrooms, while to provide a lounge for visitors a considerable space in the centre has been kept practically free from apparatus, though a few selected ceiling lighting fittings, wall brackets and floor standards have been included. All round this lounge, separated by decorative columns, are various compact departments containing examples respectively of lamp shades and figure lamps; special low-priced three-light pendant and ceiling lighting fittings and fires; small lighting fittings, glassware, "baby" cookers and refrigerators; the larger types of shades and also bedlights; lanterns, indirect floor standards and vacuum cleaners; industrial lighting pendants; industrial ceiling units, wall brackets; and a display of various small appliances, such as kettles, irons, toasters, &c. Many new and exclusive designs are to be seen among the lighting fittings and shades, the latter being made by the associated company, Mayfair Shades, Ltd.

The new Wilec domestic appliance showrooms in City Road, London [*Elec. Rev.* photo.

The Institute of Welding

OVER four hundred members and guests attended the annual dinner of the Institute of Welding at Grosvenor House, London, on October 26th. In proposing the toast of "The Institute," Sir Frank Smith (secretary of the Royal Society and of the Department of Scientific and Industrial Research) mentioned that welding was commonly used in over 200 industries. One particular make of motor car contained over 3,000 individual welds, and more than 75 per cent. of a ship like the *Ark Royal*, 800 ft. long and 100 ft. wide, had been constructed by welding, 190 welders being employed in the ship itself during construction. In shipbuilding the need for gas-tight work in refrigerated holds in ships carrying fruit and meat was now frequently met by welding. This development was particularly interesting when it was remembered that only a few years ago it was considered quite impossible to make a non-porous weld. The recently published report of the Welding Panel of the Steel Structures Research Committee provided information which should be useful as a basis of a code of practice for the use of electric arc welding in building construction. The task of drawing up such a code had been handed over to a committee of the Institute, which had recently been reorganised. So long as they knew that the industry was basing its faith on scientific knowledge they would have complete confidence in it. In responding, Sir William Larke (the president) stated that the membership had increased by nearly 25 per cent. and had reached a total of 1,300, but it was not yet representative of either the importance or the wide distribution of the interest in welding throughout the country. The demand for the formation of new local branches and discussion centres was such that special provision had been made in the organisation by the appointment of an assistant secretary charged with this work.

The Hon. Mr. Justice Langton replied to the toast of "The Guests" and congratulated the Institute on its growth.

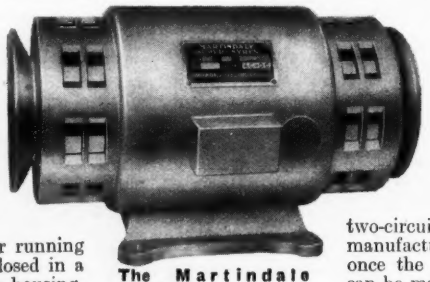
New Electrical Products

A review of equipment recently marketed

A Syren for Air Raid Warnings

A DOUBLE-ENDED syren intended primarily as an air raid warning signal has been introduced by the MARTINDALE ELECTRIC CO., LTD., Westmorland Road, London, N.W.9.

Its weight is only 21 lb., so that it can be carried to the top of a building and connected into the ordinary lighting supply, whether AC or DC. It reaches its highest note in about three seconds, the maximum frequency being 1,000 cycles, the optimum for the human ear. It has a long diminishing wail which can be cut off sharply by dynamic braking.



The Martindale "D.E." syren

The syren is driven by a 1-HP motor running on oil-less ball bearings and totally enclosed in a weather-proof machined cast aluminium housing. There are two eight-voice rotors and stators, and the loading is 700 W at 7,600 RPM. An audibility of over two miles in still air is claimed by the company.

An Animal Clipper

The latest addition to the extensive range of horse and cattle clippers manufactured by the WOLSELEY SHEEP SHEARING MACHINE CO., LTD., Electric Avenue, Witton, Birmingham, 6, is the "Safeclip," an electric clipper with a built-in motor. It is operated through a low-voltage transformer, the loading being about 40 W. The geared universal motor has ball bearings and operates standard plates through spiral gears. A finger guard is provided to give a comfortable grip. The weight of the clipper is 51 oz., the overall length being 7¼ in. It has a built-in switch. The transformer gives a speed of 1,000, 1,500 and 1,800 RPM, so that by means of a simple plug control the speed can be varied for clipping around such sensitive parts as the ears.

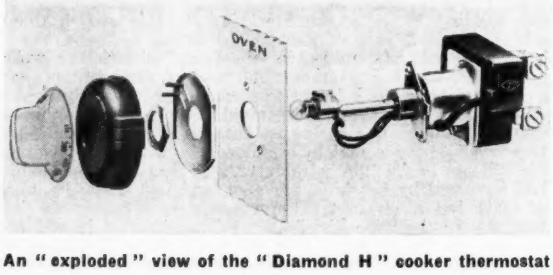
The Wolseley "Safeclip"

In addition to operation through a transformer the "Safeclip" can be worked off 6- or 12-V accumulators.

The clipper is supplied in a neat wooden box complete with high- and low-voltage cables, transformer, light plug and plates. A "De-Luxe" model includes two 6-V lamps in the handpiece which illuminate the part of the animal being clipped.

Improved Cooker Thermostat

Some improvements have recently been effected in the design of the cooker thermostat made by "DIAMOND H" SWITCHES, LTD., Gunnersbury Avenue, London, W.4. The operating principle has not been changed and consists of a sealed hydraulic unit and a flexible capillary terminating in metal bellows, the expansion of which acts directly on the insulating member, which in turn presses the switch arms. These arms are provided with tips of fine silver and form part of the current-carrying system. The latest improvement is principally with a view to eliminating panel drilling difficulties. No additional arrangement has to be made on cookers which ultimately may be converted to thermostatic control other than for a hole leading from the switch chamber into the oven itself. Several cooker manufacturers are now providing this together with a packing gland and two fixing brackets which will carry the active bulb of the thermostat. The fixing arrangement consists of a plate and a screwed barrel, which goes through the hole in the cooker panel. A lampholder for the pilot light is connected by two flexible



An "exploded" view of the "Diamond H" cooker thermostat

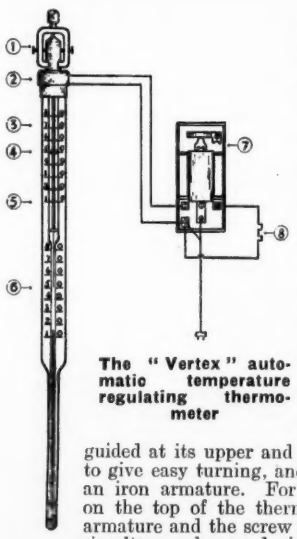
leads to the thermostat which also threads through the switch hole. The one-hole fixing bush is similar to that on a standard flush cooker switch. Handles will ultimately be available in both the screw-on or push-on types. Except when the pointer is vertical the thermostat is on. Calibration can be carried out by the supply company or cooker manufacturers when fitting by means of the adjusting screw at the back. The resistance, which is thoroughly insulated, is available in two types, one of which is of a flexible character, the object being that it can be connected straight on to the nearest neutral point without having to carry any connections direct from the neutral to the thermostat itself. The thermostat can be supplied in either the s.p. or d.p. "on and off" type, or a s.p. two-circuit instrument is available in cases where manufacturers or supply companies consider that once the oven temperature has been built up it can be maintained by half the loading. After the required temperature has been reached both circuits switch off and then only one will switch in and out to maintain the circuit, unless the temperature drops 30 to 50 deg., in which case both circuits come in to boost up the temperature.

Ball Bearings

Additions have been made to the range of R.M.B. ball bearings marketed by MINIATURE BEARINGS, LTD., 2 and 3, Duke Street, St. James's, London, S.W.1. These are Type M (completely enclosed) "massive oblique" for gyroscopes and similar instruments and Type R (which cannot be dismantled) for withstanding radial stress as well as light axial stress. In both types the ball bearings are fitted in the same way as standard bearings of larger dimensions. Diameters range from 5 to 15 mm. in the first case and from 4 to 20 mm. in the second. The new catalogue of the company contains notes on friction, loading capacity and flexible assembly. These ball bearings are not intended for use for the measuring elements of any type of electrical instrument.

Temperature Regulating Thermometers

A recent introduction to the British market is the "Vertex," regulating thermometer which is being sold by G. MAINZER, 13-14, Dartmouth Street, London, S.W.1. This contact thermometer has a magnetic micrometer screw adjustment which can be set at from −30 to +630 deg. C.



The "Vertex" automatic temperature regulating thermometer

The illustration is a transverse section. The upper part shows the adjusting scale underneath which the real temperature scale is placed, and within the extent of this latter scale the contact takes place. The adjusting device is hermetically sealed into the sheath of the thermometer, so that the neutral gas with which it is filled cannot escape. The capillary tube of the adjusting scale is oval, enclosing a rising and descending screw nut. The rod bearing the screw nut is guided at its upper and lower ends by iron supports to give easy turning, and near its upper end it bears an iron armature. For adjustment the magnet set on the top of the thermometer is turned; the iron armature and the screw rod on which it is fixed turn simultaneously, producing rise and descent of the screw nut in accordance with the left or right turning of the magnet.

The contact wire is fixed on the screw nut, entering into the lower part of the capillary tube and extending itself to the degree which corresponds to that shown by the upper edge of the screw nut. The inner connecting wires are placed behind the scale. The top of the thermometer is protected by a bakelite cap in which the exterior connecting wires have to be introduced.

The control units can be supplied with an accuracy of within 0.02 deg. C., and after adjustment the magnets can be removed to avoid tampering by unauthorised persons. The references in the drawing are as follows:—(1) Hand operated revolving magnet moving an armature inside the sealed glass tube. (2) Bakelite cap covering the end of the sealed glass tube and housing the revolving armature. (3) Threaded spindle. (4) Indicator for preselecting the desired temperature to be constantly maintained. (5) Thin wire attached to the indicator, the lower end corresponding with the indicator reading on

the upper setting scale, and making contact with the mercury when the desired temperature is reached. (6) End of thin contact wire on lower reading scale, in gasfilled tube, for making contact with the mercury. (7) Mercury relay. (8) Alarm device or heaters to be controlled.

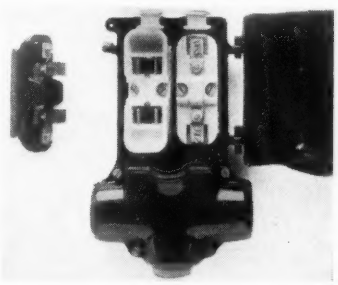
Electric Fires

MORPHY RICHARDS, LTD., Arterial Road, St. Mary Cray, Kent, have added to the existing "Junior," "Senior" and "Tubular" range of fires a lower priced series known as the "Cray." They are of modern design with brass reflectors, nickel and chromium plated, a die cast frame, porcelain insulators between the reflector and elements and six feet of three-core flex. The standard colours are ivory, green and black, with chromium bands inlaid in the frame. Four sizes are available, with loadings of 750 W, 1,000 W, 1,500 W, and 2,000 W. The larger sizes are provided with a switch to give half heat.

The 750-W "Cray" fire

Cut-outs with H.R.C. Fuses

To meet the growing demand for cut-outs with high-rupturing-capacity fuses BRITISH INSULATED CABLES, LTD., Prescot, now fit these fuses, when required, in the standard 250-V cut-outs designed for semi-enclosed fuses. The company has produced a series of bakelite fuse-carriers which take the English Electric Co.'s high-rupturing-capacity fuses and are interchangeable with the B.I. porcelain rewireable fuse-carriers of the same rating. The cover of the ironclad cut-out is slightly deeper, to accommodate the bakelite carrier. In the single-pole non-conductive case cut-out the fuse-carrier and cover are in one piece. These fuse-carriers and covers can be supplied for most of the 30- and 60-A cut-outs shown in the makers' current lists, and cut-outs which are already in use can be converted without disconnecting the cables.

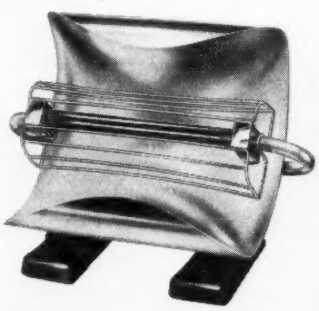


The B.I. ironclad service cut-out with high-rupturing capacity fuses in bakelite carrier

A Radiant Fire

An addition to the range of household appliances of the GRAMOPHONE CO., LTD., 104, New Bond Street, London, W.1, is the H.M.V. radiant fire.

The reflector is designed to give a wide angle of reflection—actually over a radius of 180 deg.—and is known as the "Duplex Action" reflector. It is constructed of welded steel, double-plated with nickel and finally chromium plated.



The new H.M.V. electric fire

The 3-kW element operates at a high temperature, the refractory material or rod being designed to withstand 1,300 deg. C. The end caps are nickel pressings, locked on to the formers and swaged round the resistance wire to give metal to metal contact. The end caps drop into spring clips of a special temperature resisting alloy, mounted on mica plates. The ends of the elements are totally enclosed in chromium-plated metal boxes which are supported by chromium-plated steel tubes.

A two-heat switch is incorporated. The fire has a smooth finish and is fitted with rubber padded platform feet. There is an easily removable wire guard in addition to a heat-proof glass rod which is designed to prevent accidental contact with the elements.

The dimensions are 14 in. high, 18 in. wide and 9½ in. deep, the weight being 11 lb. Five feet of three-core flex is supplied.

An Electric Water Still

A new design of water still has just been added to the range of industrial electrical appliances made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The water is boiled in the lower part of the vessel, and the steam condenses on the inverted cone-shaped lid. Special means are provided to prevent contamination, and a constant water level attachment is fitted so that the still cannot boil dry so long as cooling water is flowing. The heating elements are of the resistance type and are readily replaceable. The body of the still is constructed of heavy gauge copper, tinned inside.

The G.E.C. still

Two sizes are available with outputs of 4 and 8 pints of distilled water per hour; the corresponding loadings are 2.4 and 4 kW. Where large quantities of water are required it should be noted that the bigger still gives double the output with a smaller increase in loading, and a very small increase in external dimensions.

Commercial Steam Cooking Unit

The "Queen Bee" electrically heated cooking table made by NELSONS (PRESTON), LTD., Gillett Street, Preston, is a self-contained steam cooking unit. Only low pressure steam is used and the equipment can therefore be safely handled by unskilled persons.

The heat is applied directly inside the pan on to the food, which is placed into the pans dry. For cooking food such as potatoes, cabbage, fish and steamed puddings, &c., where liquid is not required, only the outer pan and a grid in the bottom are used. When cooking food where liquid is retained (such as stewed meat or chicken) an inner pan with a solid bottom is employed.

The pans are so made that when the liquid foods are cooked half a turn given to the inner pan will prevent the steam from entering and yet keep the food hot all day for serving. The illustration shows a steam cooking table with twelve points for cooking, the top and the body being finished in mirror-polished stainless steel and well insulated to retain the heat. The body is divided into two parts, one half being used as a hot cupboard and the other for holding the steam-raising boiler, hot-water tank and cold-water tank. The small steam-raising boiler is made of monel metal, and is fitted with a visible thermostatic control and tell-tale temperature dial. The thermostatic controls and two three-heat switches are shown in the inserted panel on the body.

The thermostatically controlled hot-water tank is made of heavily tinned copper and fitted with a draw-off tap, the temperature being maintained at 180 deg. so that food in all the pans will commence cooking within ten minutes of switching on. The cold-water tank is automatically controlled and connected direct to the water main. The loadings are: steam boiler 7½ kW, hot-water tank 1½ kW, and hot cupboard 1 kW, and the table cooks 100 lb. of food at one time.

The pans are 12 in. in dia. and 7 in. deep. Single or double pans can be used as required, and each fits loosely over a steaming point controlled by a handle. In the illustration there are ten pans, and a bain marie over the two end steaming points.

The "Queen Bee" steam cooking unit

Personal and Social

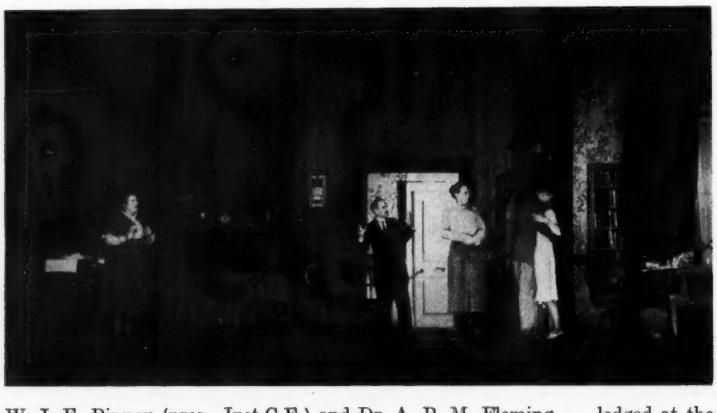
Information regarding new appointments and other matters of interest for this page are welcomed

ABOUT 680 people attended Henley's annual staff dinner and dance at the Wharncliffe Rooms, Marylebone, on Saturday evening last; **Mr. Ernest E. Judge,** manager of the company's Gravesend works, presided. The toast list was commendably short and not too serious. Mr. A. H. Foster (cashier) proposed "The Henley Companies" in an amusing manner and said that the good relationships in the company were manifested by the reluctance of the staff to leave Henley's. He referred briefly to the activities of the cable and tyre companies, the South African Co., the Holborn Construction Co., and the Extrusion Machine Co. Mr. Judge responded in similar vein. He said that the constitution of the companies was as follows:—Shareholders, representing money; the staff providing brains; and the workpeople brawn. Carnegie had said that a good manager was one who secured the services of men abler than himself; on this score Mr. Judge modestly claimed to be a good manager. He concluded with a reference to the beneficial work of the company for its staff and the community. Sir Montague Hughman (chairman of Henley's) then presented the Lady Hughman Challenge Bowl and the City Livery Cup to representatives of the Gravesend works who had won both trophies. He said that their success was due to voluntary effort; he asked them to give national service as willingly. Mr. W. A. Moore (joint advertising manager) proposed the chairman's health in a felicitous manner, mentioning that Mr. Judge had started well down the ladder and had risen by merit to his present position. He had been responsible for a good many patents standing in the company's name, including the straight-through lead press. Mr. Judge briefly responded and the company then adjourned to the Winter Garden of the hotel for a most enjoyable dance. During the evening the chairman read telegrams from absent friends, including Lady Hughman.

Mr. W. F. Knight, who for many years has been associated with Bull Motors, Ipswich, and the Rheostatic Co., Ltd., Slough, is relinquishing his position with Bull Motors, having joined the board of the Rheostatic Co. as sales director. Arrangements are being made to relieve Mr. Knight of his duties with Bull Motors as soon as conveniently possible. In the meantime, he will be dividing his time between the interests of the two companies and can be communicated with at either Bull Motors, 86, Strand, W.C.2, or the Rheostatic Co., Slough.

Mr. H. Richardson, A.M.I.E.E., has been appointed senior sales engineer of the London staff of Bull Motors, which he joined two years ago, having previously been with the General Electric Company.

In proposing the toast of "Faraday House" at the thirteenth annual dinner of Faraday House Old Students' Association which was held at the Savoy Hotel on October 28th, **Mr. C. H. Sparks** (president of the Association), taking the chair, Sir George Lee (past-president, I.E.E.) criticised the usual methods of giving academic training (we comment on this in our leader columns) and expressed the view that in its liberal outlook Faraday House was ahead of others. Dr. Alexander Russell (advisory principal), responding, justified the "sandwich" system by reference to the distinguished careers of old students. The average number of new students in a year was only eighty, yet one in five of I.E.E. presidents had been old Faradians. Dr. W. R. C. Coode-Adams (principal), also responding, mentioned recent extensions of plant at the College. He also referred to the presence in the College, as students, of grandsons of Willoughby Smith, Crookes and Ferranti, who had been concerned in its foundation. Five Faradians, he said, had been presidents of the S.A. Institute of Electrical Engineers. Mr. C. H. P. Ewbank (chief engineer, Edmundsons) proposed the toast of "The Guests," to which Mr. V. Z. de Ferranti proposed "The Chairman," to which Mr. Sparks briefly responded.



W. J. E. Binney (pres., Inst.C.E.) and Dr. A. P. M. Fleming (pres., I.E.E.) responded. The latter expressed the view that Faraday House had contributed more than its share towards the development of electricity and was continuing to do so.

At the opening of the new Electricity House at Watford last Saturday **Mr. A. W. Barham** was presented with a silver salver to commemorate his twenty-five years' service with the Corporation as chief electrical engineer.

Mr. M. Pollock-Hill, a director of Ismay Industries, Ltd., has been appointed director and general manager of John Ismay & Sons, Ltd. **Mr. J. Bingham,** who has for many years been in charge of the export department, has been appointed general sales manager of the company, and **Mr. G. Mansell,** a director of Briton Lamps, Ltd., has been appointed assistant sales manager. As and from November 1st, 1938, Briton Lamps, Ltd., will cease to operate as a separate company, and all lamps which it hitherto marketed will be handled by the manufacturers, John Ismay & Sons, Ltd.

A large gathering sat down to the annual dinner of the staff guild of British Insulated Cables, Ltd., which was held at the Adelphi Hotel, Liverpool, on October 28. **Mr. T. Harding,** of Helsby, chairman of the guild, presided in the main dining-room, and those present included Sir Alexander Roger, chairman of the company, and Lady Roger, Mr. G. H. Nisbett, managing director, and Mrs. Nisbett. Mr. R. A. Pilkington, M.P. for Widnes, was among the guests. Mr.

At the annual staff dinner of British Insulated Cables, Ltd., showing (left to right) Mrs. and Mr. G. H. Nisbett and Sir Alexander and Lady Roger

H. R. S. Preston, proposing the toast of the company, coupled with the name of Sir Alexander Roger, remarked upon the fact that it was the fiftieth anniversary year of the Prescot Co., and in reply Sir Alexander Roger referred to this and said that to-day there were 10,000 B.I. employés scattered throughout the world, and 20,000 if one included the employés of the Automatic Telephone Co. group, in which the B.I. had a very substantial interest. Starting with a capital of a few thousand pounds, the group to-day had assets of twenty million sterling. Later in the evening there was a concert, a whist drive and dancing in the ballroom. During the evening Mr. G. H. Nisbett presented long-service medals to thirty members of the staff.

On Monday and Tuesday last the G.E.C. Dramatic Society gave its annual show at the Fortune Theatre for the Infants' Hospital, Westminster, when it presented "The Late Christopher Bean," by Emlyn Williams. The G.E.C. Players have long since established themselves as a dramatic society of the front rank, and their latest presentation worthily upheld that reputation. The action of the play centres around the paintings of the late Christopher Bean, whose genius is not recognised until after his death. The sudden invasion of treasure hunters into the home of a country doctor provides many amusing moments, and gave the members of the cast full scope for their talents of characterisation. Of the players first place must be given to Miss Constance Needham who in playing the part of "Gwenny," the Welsh servant, scored a triumph which was duly acknowledged at the fall of the final curtain. Edgar Penwarden, as "Dr. Haggett," and Irene Herod as his wife, gave the finished performances which we have come to expect of them, while Leslie Wrist (a newcomer to the Society), as "Bruce McRae."

A scene from "The late Christopher Bean" presented by the G.E.C. Players

a humble disciple of the great Christopher, might well have come from over the border. Elsie Wake, Lilian Ellison, and Norman Pitt, Clement Harrison and Colin Cheyne in the lesser parts, gave able support to a performance which was generally excellent.

Mr. J. H. Headley retired on October 31st, after forty-eight years in the electrical industry and thirty-five years with Laurence, Scott & Electromotors, Ltd. He received his training with Newtons, of Taunton. In his five years there he saw the slotted armature and carbon brushes come into general use and conducted tests on ring oiling bearings which were taking the place of sight feed lubricators. One of Newtons' specialities at this time was a lightweight motor for the electric launches which had a brief spell of popularity on the Thames. The battery was divided into four groups to give parallel, series parallel and plain series steps. About 1895 Mr. Headley joined the G.E.C., which was then planning its Salford Works for the manufacture of electric motors. He tested the first motor made there, and among other jobs installed the first three-phase coal cutter, spending a fortnight at Silkstone Colliery working at the face to demonstrate the capabilities of the machine. In 1903 he joined Electromotors, Ltd., and travelled all over the country for the company. For twenty-five years, prior to the amalgamation with Laurence, Scott & Co., he was manager of the company's London office. Among other expressions and tokens of good will, Mr. Headley has been presented by his colleagues with a lawn mower.

Mr. J. H. Headley

The engagement is announced of **Miss V. F. Swarbrick,** of the English Electric Co., Ltd., to **Mr. J. T. Sanders,** of Johnson & Phillips, Ltd. Miss Swarbrick, who is the daughter of Mr. F. Swarbrick, the borough electrical engineer at Hove, is well known in electrical circles as a chief demonstrator for the English Electric Co., Ltd., and Mr. Sanders is a member of the London sales engineers' staff of Johnson & Phillips, specialising in the development of electric water heating in London and the provinces.

Mr. G. H. Blackburn, of Poole, has been appointed technical assistant to the superintendent of the Installation Department of the Ipswich Corporation electricity undertaking.

Councillor J. W. Mayall, managing director of Mayall & Co., Ltd., Birmingham, has been re-elected unopposed to the Sutton Coldfield Town Council.

On Monday evening last a large number of the staff and employés of the Wimbledon Corporation Electricity Department gathered at the generating station to say farewell to **Mr. F. J. Page,** the mains foreman, who is retiring on superannuation. The chair was taken by Mr. A. E. McKenzie, the chief engineer and manager, who gave a short history of the undertaking. Mr. McKenzie said that no department of the Corporation could have had a more loyal assistant than Mr. Page. He expressed regret that ill health had hastened Mr. Page's retirement, and hoped that a complete rest would soon restore him to a state of good health. Mr. W. J. Oswald, the chief assistant engineer, and Mr. A. H. Shotter, the mains engineer, also paid tributes to Mr. Page, and Mr. McKenzie presented him with a barometer bearing an inscribed silver plate, together with a wallet containing notes. Mr. Page responded.

Mr. A. M. Strickland commenced his duties as testing engineer to the Wolverhampton Corporation on November 1st. He is responsible for the meter department and for general electrical testing work. After being apprenticed to general engineers, he joined the Metropolitan-Vickers Electrical Co., Ltd., Manchester, then the Westinghouse Co., and had experience in the meter and other departments. His period of service there was broken by war service in the R.E. Signals, and part of the time he was an instructor in the Rhine Army Technical College. From 1921-24 he was electrical engineer at the Frontino and Bolivia Mines, South America. In 1925 he joined the Manchester Corporation electricity undertaking's testing department, where he gained considerable experience in the work of a supply authority's meter department, finally becoming responsible for the AC testing section. His technical training was obtained at the Salford Royal Technical College and the Manchester College of Technology, and he obtained the B.Sc. Eng. external degree of the London University. He has always been keenly interested in the Meter and Instrument Section of the I.E.E., and gave a lecture before it, describing metering conditions in Paris.

The annual dinner, dance and whist drive organised by the West Yorkshire Section of the Electrical Power Engineers' Association was held on October 28th at Leeds, when **Mr. J. C. Welburn** (chairman of the Section) presided over a gathering of 200 members and friends. The guests included the Mayor of Wakefield (Ald. T. Crowe, former member of the District Committee under the National Joint Board for the Electrical Industry); the president of the Association (Mr. L. Hoskison, Manchester); chairmen of the Electricity Committees of Halifax, Wakefield, Batley, Ilkley and Elland; Mr. R. H. Toynbee, chairman of No. 2 District Joint Board; the electrical engineers of Halifax, Keighley, Dewsbury, Batley, Ilkeley, Hebden Bridge and Elland; and Mr. W. A. Jones, general secretary of the E.P.E.A. The Mayor of Wakefield, proposing the toast of the Association, complimented the organisation on its educational work, its legal advice and benevolence as well as its protective activity in regard to salaries, wages and conditions of service. As one who had a great belief in trade and professional organisation he congratulated the E.P.E.A. on having in its membership 90 per cent. of the men who might be regarded as eligible. Ald. Crowe commented on the fact that this was the silver jubilee year of the E.P.E.A. He was a member of the District Joint Board for some years, and he was convinced that that was the most satisfactory method of conducting negotiations between employers and employés. Mr. L. Hoskison, President of the Association, responding, paid tribute to the fair and reasonable attitude of the employers' side of the National Joint Board and the happier conditions which had obtained as a result of the establishment of that method of negotiation. Mr. J. F. Sarvent, resident engineer, Kirkstall power station, Leeds, and past-president of the Association, proposed a toast to the ladies and guests. Mr. G. A. Vowles, borough electrical engineer of Halifax, responded.

Mr. J. Lambert, who recently retired from the post of chief electrical engineer to Perth Corporation after nearly forty years' service, has been presented by Councillor G. G. Fairlie, convener of the Electricity Committee, and members of the Department with a pair of antique Sheffield plate candlesticks.

Obituary

Mr. C. N. Hefford.—It is with deep regret that we have to record the death of Mr. C. Nelson Hefford, general manager of the Leeds Corporation Electricity Department, which occurred on October 26th in a Leeds nursing home following an operation for appendicitis. Mr. Hefford, who was sixty-three, was a native of Somerset and went to Leeds at an early age, receiving his education at the Leeds Parish Church Middle Class School and Leeds University, where he obtained his engineering degree. For seven years he was with J. & H. McLaren, Ltd., of Leeds, with whom he served a three years' apprenticeship, and later became successively draughtsman and test-plate engineer and chief draughtsman and designer. He entered the service of Leeds Corporation in 1904 as chief engineering assistant and was appointed general manager in January, 1913. Mr. Hefford was a M.Sc. with honours in engineering in the Universities of Leeds and Manchester, and was an associate member of the Institution of Civil Engineers and a member of the I.E.E. Apart from his work with the Leeds Corporation he was identified with the Leeds University and served for many years as a member of the University House and Estates Committee and the Engineering Advisory Committee. He was hon. secretary and treasurer of the Mid-East England Centre of the I.M.E.A., a post he had held since 1932. He was also a member for many years of the No. 2 Area D.J.I.C. and until recently a member of the Technical Consultative Committee of the Central Electricity Board in the Mid-East England Area. Mr. Hefford leaves a widow and a son and daughter.

The late Mr. C. Nelson Hefford

Mrs. Sainsbury.—We regret to learn of the death of the youngest daughter of Mr. and Mrs. L. E. Wilson, Mrs. Dorothy Ethel Sainsbury, which occurred in Nigeria as the result of an accident. Mr. Wilson is head of L. E. Wilson & Co., Ltd., electrical engineers, of Manchester.

Mr. C. F. de Nordwall.—We regret to record the death, which occurred on October 29th, of Mr. C. F. de Nordwall, M.I.E.E., F.R.C.I., at the age of eighty-eight. Mr. de Nordwall had been connected with the electrical industry since 1882, having spent fifteen years in the British Colonies, China, Japan and the United States. Some of the positions which he held included London director of the A.E.G., director of the Electrical Co., Ltd., and during the War he joined the Electrical Department of Vickers, Ltd., where from 1919 to 1924 he managed the hydro-electric department; during 1922-1924 he was also on the board of the Metropolitan-Vickers Electrical Export Co., Ltd. He retired in 1924 from active business.

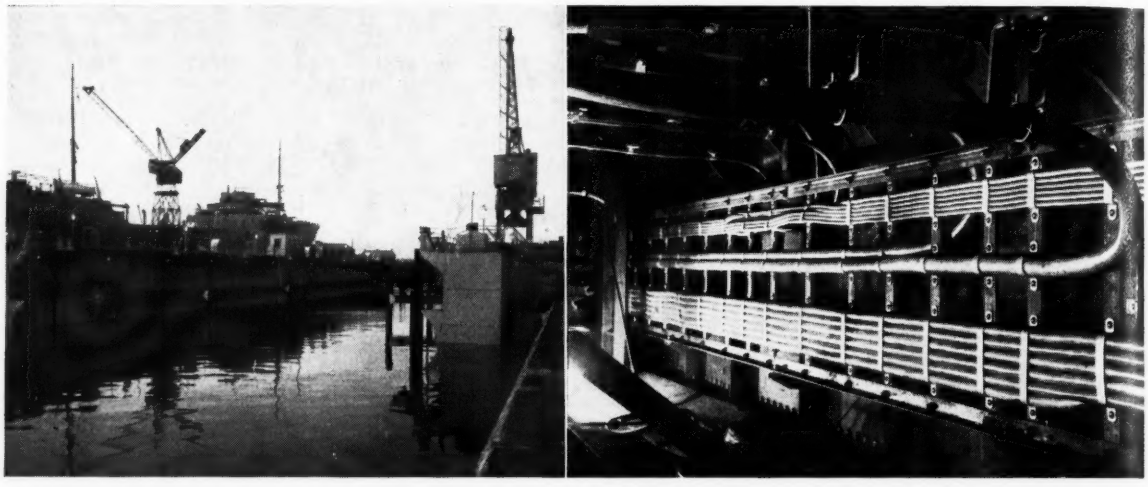
Mr. T. L. Price, a director of Blackstone & Co., Ltd., of Stamford (Lincs.), died suddenly on November 1st in his eighty-fifth year; he was actively engaged on his company's business up to the end. Mr. Price was born and educated in Shrewsbury. He joined the company then known as Jeffrey & Blackstone in 1884 as sales representative for the British Isles. In 1924 he became home sales manager of Blackstone & Co., and in 1935 he was elected to the board.

Commercial and Industrial News

Large Floating Dock. Leicester Lighting Conference. Export Trade Development. Contractors and Water Heating. Brewers' Exhibition.

A Large Floating Dock

ON tow on the high seas bound for Durban *via* the Suez Canal is a 4,000-ton floating dock built by the Furness Shipbuilding Co., of Haverton-Hill-on-Tees, for the South African Railways and Harbours Administration. The 7,000-mile voyage by one tug, the 1,800-HP Diesel-engined *Roodee Zee*, of Rotterdam, a remarkable towage feat, is taking approximately three months, during which a crew of ten men are living aboard the dock in specially built cabins. The dock, which will be stationed at Durban, was launched at the end of July from the Haverton Hill yards of the builders. Capable of lifting a vessel of 4,000 tons displacement and 17 ft. 6 in. draft in 80 minutes, it was constructed to the design of Clark & Standfield, of London. Its overall length is 350 ft., width 88 ft., and clear width between fenders 63 ft. 11 in. The launching weight was practically 3,000 tons. Pumps and other machinery are electrically operated by means of a shore supply, Henley

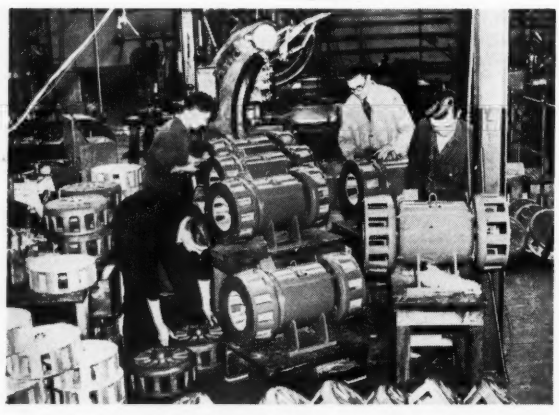


A floating dock for the South African Railways and Harbours Administration showing (right) Henley cables under the port side switchboard room

cables being installed throughout. Mechanically operated side shores and bilge blocks and the arrangement of keel and bilge blocks have been designed to facilitate the rapid handling of a single large vessel or four smaller ones.

Air Raid Warning Syrens

Gent & Co., Ltd., are busily engaged in the production of air raid warning syrens. These 4-h.p. electro-motor syrens have been specified by the Home Office and are being installed in the whole of the London Metropolitan area, while this type of syren is being rapidly installed all over the country by local authorities. They absorb the full 4 HP and run at 2,000



Producing air-raid warning syrens at the Leicester works of Gent & Co., Ltd.

RPM. In the accompanying illustration we show some of the syrens in course of production at the company's Leicester works.

Leicester Street Lighting Conference

Street-lighting matters were discussed at a conference held in Leicester on October 28th. Arranged by the British Electrical Development Association in conjunction with the Electric Lamp Manufacturers' Association, it was presided over by Coun. J. Minto (chairman of the Electricity Committee of the City Council), twenty-four towns and districts being represented. Among those present were the Mayor of Loughborough (Ald. A. Lacey), the Mayor of Nuneaton (Ald. W. Croshaw), and Messrs. J. Mould (Leicester city electrical engineer), J. Mitchell, gas engineer, B. England, transport manager, and T. Wilkie, public lighting engineer. Councillor Minto said that the better lighting of streets had resulted in fewer accidents and less crime. Mr. P. Wardle, of Cannock, replied to the welcome given by the chairman. The Lord Mayor, who was present at the opening of the conference, said that some years ago Leicester realised that street lighting was bound to develop into a highly specialised public service and it was decided to appoint a full-time public lighting engineer. That decision they did not regret, and he paid a tribute to the work of Mr. Wilkie. Mr. S. S. Beggs, of London, dealt with modern street lighting, describing the principles of good, accident-proof lighting. Mr. T. Catten, of London, lectured on the development of electric filament and discharge lamps. The discussion which followed on the subject of organisation, economics and administration of street lighting was opened by Mr. T. Wilkie, who spoke of the lighting system in Leicester, and said that practically the whole of the central streets were illuminated by electricity controlled from the central office. The lamps could all be lighted in three seconds and the lighting could be extinguished in eighty-eight seconds.

A Heating and Ventilating Exhibition

The Heating, Ventilation and Air Conditioning Exhibition Co., Shell-Mex House, Strand, London, W.C.2, has been formed for the furtherance of the science of heating, ventilation and air conditioning. It is intended to hold the first exhibition in the trade at the Horticultural Hall, Westminster, from September 28th to October 7th, 1939. The exhibition will be held biennially in the new hall in the years in which the Building Exhibition is not held. The directors of the Exhibition Co. are Mr. V. A. Kraminsky and Mr. C. W. Glover.

The Institute of Export

On Friday last the Birmingham and Midlands Area Branch of the Institute of Export was formally inaugurated. The chair was occupied by Sir Patrick Hannon, M.P., and the speakers were the Lord Mayor of Birmingham (Councillor E. R. Canning), the Rt. Hon. R. S. Hudson, M.P. (Parliamentary Secretary to the Department of Overseas Trade), Major T. Knowles (founder-president of the Institute of Export), Mr. W. Hill (chairman of the Birmingham and Midlands Branch), and Lt.-Gen. Sir George Macdonogh (president of the Institute). Sir Patrick Hannon referred to the recent serious decline in Britain's export trade and added that an organised effort by foreign communities to obtain a more influential position in world markets was growing in intensity. No effort should be spared in organising our own forces to maintain the continuity of our influence in our export trade. Mr. Hudson said that the Export Credits Guarantee Department had had for some years a growing branch in Birmingham. During his tour of the Chambers of Commerce in the chief industrial towns last year he was impressed by the varying extent to which traders apparently made use of the Department's services. Some made extensive use while others did not know of its existence, and a large proportion did not realise how it could help them. There was no single

sovereign remedy for our difficulties. Those who were fortunate enough to be manufacturing for our sheltered home market must not forget the difficulties that faced our exporters, and he felt that the time might come when it might well prove necessary to ask the home manufacturers actively to support those in the export trade. Sir George Macdonogh observed that by an educational campaign to be promoted by the Institute it was hoped to increase the efficiency of export trade methods.

A Sales Conference at Alloa

The annual conference of the Harland Engineering Co., Ltd., was held at Alloa last week. Directors, branch managers, sales engineers from all home offices and members of the technical and commercial staff met at the B.E.P. Works to confer upon matters relating to the company's sales policy, and the discussions produced valuable and satisfactory results. The delegates to the conference and a number of their staff colleagues were entertained to dinner by the directors at Dunblane Hotel Hydro on October 25th. After Mr. F. C. Anderson (chairman), had proposed the loyal toast, Mr. C. Atherton Atchley, managing director, welcomed the party.

Burco Washing Machine

In the note under this heading in our last issue (p. 618) we referred in the last sentence to "the ironing attachment"; this, as was clear from the context, should have been "wringer."

Electrical Domestic Science

The London School of Electrical Domestic Science, which was opened at Imperial Court, 2, Basil Street, Knightsbridge, S.W.3, nearly five years ago, has outgrown its original accommodation, and on Tuesday last Miss H. M. M. Minoprio, the principal, held a house-warming to celebrate the opening of the new extension. Considerable structural alterations have been made to the school; the extensions include a new demonstration theatre in which a platform has been erected from which cooking demonstrations will be given, and a new lecture room of ample dimensions. The colour scheme and the modern lighting have been designed to create an atmosphere of brightness, while the equipment, supplied by a number of well-known manufacturers of domestic electrical equipment, is of the latest design available. There are now twelve rooms in all which include, in addition to those already mentioned, an electric kitchen, laundry, stores, offices and reception room. The total connected load at the school is in the neighbourhood of 250 kW, and the electrical work was carried out by Troughton & Young, Ltd., who were responsible for the original installation.

The Tipton Industrial Exhibition

In our last issue we referred to the industrial electrical exhibition held recently at Tipton under the auspices of the Midland Electric Corporation for Power Distribution, Ltd. In

A section of the industrial electrical exhibition recently held at Tipton

sending us the accompanying illustration of the Exhibition, the company states that during its run there was a good attendance and the exhibitors were fully satisfied with the contacts made. The company considers that a useful service has been rendered to industrialists in its area of supply.

The Electrical Industries Ball

Particular efforts are being made to spring some surprises at the cabaret which is part of the entertainment offered by the Electrical Industries Benevolent Association at Grosvenor House, Park Lane, on Tuesday, November 22nd. Among those who will be appearing are Tommy Trinder and Ernest Butcher; there is also to be some unique and beautiful dancing by a troupe entirely new to this country, the Paul Oscard Adorables, and some last-minute surprises are also promised. Tables can be reserved and tickets obtained on application to the Secretary, E.I.B.A., 6, Southampton Street, W.C.1.

Diaries

We have received copies of the 1939 diaries of *The Autocar*, *The Amateur Photographer* (bound in navy-blue leatherette), *The Wireless World* and *The Motor Cycle* (in dark red leatherette). Each of these diaries contains a good deal of information which will prove of value to those interested in the subjects with which they deal. They are obtainable from Iliffe & Sons Ltd., Dorset House, Stamford Street, S.E.1, or from booksellers and stationers at 1s. 6d. net.

Works Visit

A visit was paid recently by a number of well-known men to the works of Aberdare Cables. The principal guest was Mr. Lennox-Boyd, Parliamentary Secretary to the Ministry of

Mr. Lennox-Boyd, Parliamentary Secretary to the Ministry of Transport, at the works of Aberdare Cables

Labour, and he was accompanied by Mr. G. H. Hall, M.P. for Aberdare, and a number of municipal officials of Merthyr. The visitors were shown the various processes in manufacturing the company's cables.

Ozonising Plant for Baths

The Newcastle-upon-Tyne Corporation has had installed at its Fenham and Jesmond baths "S.A." ozone sterilising plants manufactured by Bruce H. Auld & Co., Ltd. (subsidiary of the Visco Engineering Co., Ltd.). The plant consists of steel trunkings, specially treated internally to withstand the action of ozone) in which are assembled a number of ozone generating tubes, the number required depending on the capacity of the pool. The trunkings are made in standard sectional units with glazed fronts so that the working of the unit is visible at all times. After the water leaves the filters it is driven by a small rotary blower to the delivery main and to a series of jets laid in the floor of the bath and brought flush with the tiles. This system ensures that the water from one end of the bath to the other is maintained in a perfectly sterile condition. The operating costs are low, the maximum electrical consumption for each plant, including the rotary blower, being about 1.2 kW.

Contractors and Water Heating

Technical and commercial aspects of electric water heating were discussed at a meeting convened by the Manchester Corporation Electricity Committee, and attended by electrical contractors, last week. The main object was to discuss how contractors in their own interests, as well as in those of the supply authority, could co-operate to their mutual advantage. Mr. S. Dickinson, chairman of the Manchester Branch of the Electrical Contractors' Association, who presided, said that the facilities now offered by the Corporation should result in more work for the contractor and more satisfied customers. Unless contractors gave the public essential services, they must not blame the Corporation for stepping in.

Mr. H. Wilson then gave a talk on electrical water heating as a service to the community. He discussed the various types of water heaters on the market and emphasised their suitability for particular functions. Fundamental factors to be considered in the provision of hot water must be: (1) Simplicity, (2) reliability, (3) cleanliness, (4) capital cost, and (5) running cost. A comparison was made of electric water heating against gas and coal or coke systems of water heating. Due to the high efficiency of electric water heaters, the average being 90 per cent., simplicity of installation, the running costs at ¼d. per kWh were competitive with any form of fuel. Mr. W. Wallwork, also of the Manchester Electricity Department, said the number of water heaters on hire in Manchester at the end of September last was 6,648. The number of private houses in the area of supply was 209,000, in addition to which there were 51,700 works, offices, shops, &c. Mr. Wallwork indicated how the department was prepared to co-operate with contractors by supplying water heating window displays, together with showcards and other publicity material. In cases where contractors had co-operated with the department, the latter circularised a number of the contractors' clients. This was followed up by a leaflet issued by the contractor himself. The next step

was a canvass, undertaken by the contractor, who, on booking an order, received a bonus equivalent to one quarter's hire charge. He also undertook the wiring. Since the scheme started bonuses had been paid on 290 orders.

Several of the contractors who participated in the discussion said they had certainly benefited by co-operation with the Electricity Department by putting in special displays of water heaters. It was generally agreed that moving window displays were more effective than static displays. Contractors contended that the display material should be lent for one month. Mr. G. M. Brewster, chairman of the Manchester Electrical Circle, said the remuneration offered by the Corporation was not sufficient to meet the cost of canvassing. The reply to this was that the orders for hot water heaters were picked up when canvasses were made for wiring and other appliances. A resolution was adopted unanimously in favour of a spring electric water heater campaign.

The Brewers' Exhibition

A visit to the Brewers' Exhibition, being held at the Royal Agricultural Hall, Islington, reveals that electricity is nowadays applied to practically all processes in the brewery trade. Polishing malt, screening barley, pasteurising, testing, pumping, washing barrels and bottles, nailing crates, labelling, cooling both cellars and beer, air conditioning, transportation, sign illumination and various entertainment and amusement devices are just a few of the things for which electricity is now commonly used. Apparatus displayed for bottle washing, filling and crowning is particularly abundant and ranges from single-bottle units to equipments handling 600 doz. or so an hour. A recent development in hygiene is the use of ultra-violet rays for sterilising bottles and special apparatus produced for the purpose by Hanovia, Ltd., is to be found on the stand of E. Powley & Sons, who also have an improved "Bedan" washing machine on view. A new type of fully automatic, vacuum operated rotary filler is shown for the first time by the Albro Fillers & Engineering Co., while D. G. Binnington & Co.'s new "Triumph" syruper and filler incorporates an improved filling head, adjustable syrup pump and a five-speed gear case, giving a wide selection of speeds for the maximum output according to the size of the bottle being filled. A new type of "World" automatic rotary labeller is demonstrated by the Purdy Patent Machinery Co., working in conjunction with a new double automatic top-strapper. Other new labelling machines are shown by J. W. Flowers & Co. and Labellers, Ltd. Stainless steel beer barrels are a surprise "Metrovick" manufacture on the Samuel Fox stand. Flush welded by a special patented process, the barrels have a perfectly smooth interior and are thus kept absolutely sterile. Refrigeration equipment is shown by about a dozen manufacturers. Actual cooled cellars are features of the Lightfoot and Kelvinator stands, while York Shipley bring home the comforts of air conditioning by showing a film of the company's recent developments in a specially equipped air-conditioned theatre. J. & E. Hall have two separate exhibits, one showing various types of ammonia compressors and the other examples of small installations for the temperature control of licensed premises. Special attention is drawn to instantaneous beer cooling systems and bottle-cooling cabinets on the Frigidaire stand, while a new 5½-cu. ft. "North Cold" domestic type refrigerator is among the Northern Aircraft & Engineering Products' display. A larger version of the "Cond-air" fan-heater equipment is now available from Fractional H.P. Motors, Ltd. It incorporates a 900-W element and delivers and extracts 22,500 cu. ft. of air per hour on the higher of its two speeds. The same company also shows the "Rotceptor" apparatus for operating neon signs from a car battery. A new hot water steriliser for milk bars and also an electrically heated combination counter set are shown by Astlett's. The exhibition closes this evening.

Local Exhibitions

In our last issue we referred to the electrical exhibition recently arranged by the St. Helens Corporation Electricity Department. This exhibition comprised an industrial and a domestic section, and in the accompanying illustration we show the attractive display arranged by Berry's Electric, Ltd., in the domestic section.

At an electrical exhibition held by the Felixstowe Urban District Council last week at the Pier Pavilion, Felixstowe, a number of well-known manufacturers of domestic electrical appliances took part, including the G.E.C., Hotpoint, Johnson & Phillips, Santon, Hoover, Burco, Belling and Berry's Electric. Local electrical people also exhibited and our picture shows the effectively arranged stand of Best Products, Ltd., of Felixstowe. During the run of the exhibition cooking demonstrations were given twice daily and were preceded by a brief entertainment.

Trade Announcements

McMichael Radio, Ltd., has appointed Walton & Gordon, 38a, Queen Street, Belfast, as its sole concessionaries in Northern Ireland as from November 1st.

British Electric Domestic Appliances (1938), Ltd., has now removed to Bedal Works, 27, Sandy Lane North, Wallington, Surrey. The new premises are over three times as large as the old works.

Change of Address

The Radio Manufacturers Association has removed to 59, Russell Square, London, W.C.1. (Telephone: Museum 4031 and 4032. Telegrams: Oidarion, Westcent, London).

New E.C.A. Members

At a recent meeting of the E.C.A. council a number of applications for membership were considered and the following contractors were admitted to full membership:—

Boardley & Roberts, Lowestoft; C. H. Rust, East Finchley, N.2; J. S. Bennett, Wargrave, nr. Reading; L. M. Whymant, Thornton Heath; H. T. Barden, Maidstone; A. H. Barber, Southsea; R. Ellis, Port Talbot; Lewis & Rees, Llanelly; D. J. Thomas, Llanelly; J. Williams & Son, Burry Port, Carm.; Thos. Leaman & Son, Torquay; T. H. Davis, Coventry; Whitmore & Warwick, Coventry; Frank Jowitt, Ltd., Ripley, Derbyshire; J. W. Marland, Ashton-under-Lyne; R. C. Burnell & Co., Peel, I.O.M.; A. Craig & Co., Onchan, I.O.M.; A. R. Partington, Peel, I.O.M.; W. Martindale & Co., Preston; Frank N. Gort, Lowestoft; and W. Bradley & Son, Sheffield.

The following contractors were admitted to associate membership:—

Job's Electrical Co., 231, Waterloo Road, S.E.1; J. E. Leech, Leytonstone, E.11; Tucker Bros., Hornchurch, Essex; D. P. Toomey & Co., Ltd., Brighton; E. Leaverland, Ltd., Bradford; J. H. Wilson, Whitley Bay; and Stanley P. Garnett, Broughton, Preston.

Novel Display Panels

A short time ago we described an ingenious method of producing publicity matter introduced by Masson Seeley & Co., Ltd. It comprised a machine for printing at very low cost on the user's premises showcards, price tickets and various other display matter. The result is a highly finished product which can be obtained in several colours. The type is set up upon a card by the user, who then proceeds to place a sheet of gummed manilla over it. The whole is then fed with rolls of pigmented foil into the press and subjected to great pressure by which the colours from the foil are impressed into the card. Now the company has improved on this by making it possible to produce beautifully finished display cards with a polished, washable and unscratchable surface neatly bound in metal, which, however, is not visible from the front—the panel having an entirely free surface. The new idea was introduced to the Press at a luncheon which was presided over by Dr. S. Walpole, the chairman of the company, and Mr. N. A. Howell-Everson, publicity manager.

Electrical Testing

In the I.E.E. Regulations for the Electrical Equipment of Buildings are numerous references to methods of connection and electrical values that can be ensured by testing in

The stand of Berry's Electric, Ltd., at St. Helens Exhibition, and the display of Best Products, Ltd., at Felixstowe

various ways. How the requirements of these Regulations can be met by the proper use of a "Megger" is discussed in two booklets published by Evershed & Vignoles, Ltd., entitled "Continuity and Polarity Testing" and "Insulating Testing." Both are simply written and practical in character and should be useful to those concerned in the installation and maintenance of electrical apparatus and wiring.

United States Electrical Machinery Exports

There has recently been a falling off in American exports of electrical machinery and cognate material, the value during the eight months ended with August last being returned at £14,805,340 as compared with £16,236,237 in the corresponding period of 1937, a decline of 8.6 per cent.

Damage to Overhead Lines

At the Chichester Juvenile Court recently a thirteen-year-old boy was charged with damaging wire and insulators, the property of the Bognor Gas and Electricity Co., to the extent of £4 14s. Mr. F. Ingram, the company's mains engineer, said that apparently iron hooping had been thrown over the line. The boy said that he did not intend to cause damage. He was admonished by the magistrate who dismissed the charge under the First Offenders' Act, but said that Court costs of £1 4s. would have to be paid. The company did not press a claim for the cost of the damage.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price November 2nd	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¾d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£181	—
Grade II ... ... ,,	£127	—
Grade III ... ... ,,	£70	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8½d.	—
c ,, Tubes (solid drawn) ... ... ,,	1/- to 1/0½d.	—
c ,, Wire, basis ... ... ,,	8¾d.	—
c Copper Tubes (solid drawn) ... ,,	1/1½d.	—
g ,, Bars (best selected) ... per ton	£84	—
g ,, Sheet... ... ... ,,		—
g ,, Rod ... ... ,,		—
d ,, (Electrolytic) Bars ... ... ,,	£53 10s.	10s. dec.
d ,, ,, Wire Rods ... ,,	£58 5s.	10s. dec.
d ,, ,, H.C. Wire ... per lb.	8 5/8d.	1/8d. dec.
f Ebonite Rod ¼" dia. & up. ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	8d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£18 5s.	5s. dec.
g Mercury ... ... per bot.	£14	—
e Mica (in original cases) small ... per lb.	10d. to 2/-	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/- to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1½d.	—
p ,, ,, rolled strip & sheet ,,	1/1¾d.	—
p ,, ,, wire ... ... ,,	1s. 1¾d.	—
o Platinum ... ... per oz.	£8	—
d Silicium Bronze Wire ... ... per lb.	9½d.	—
g Spelter ... ... per ton	£14 16s. 3d.	12s. 6d. dec.
g Tin, Block (English) ... ... ,,	£212 10s.	£5 10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.,
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Catalogues and Lists

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.—A catalogue of extra-high-voltage metal rectifiers for electrostatic processes.

Drayton Regulator & Instrument Co., Ltd., West Drayton.—A folder dealing with circular chart type recorders for temperature and pressure.

T. M. C. Harwell (Sales), Ltd., 233, Shaftesbury Avenue, London, W.C.2.—Details of new clocks Nos. 1,000 and 1,001.

Smith's Dish Washers, Ltd., Niagara Works, Lower Richmond Road, London, S.W.14.—A leaflet dealing with the "Niagara" dish washer.

General Electric Co., Ltd., Magnet House, Kingsway, London.—A complete catalogue of all kinds of industrial heating appliances.

Davidson & Co., Ltd., Sirocco Engg. Works, Belfast.—A 46-page catalogue of patent screw fans with blue print drawings.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2.—Leaflets dealing with the "Tecal" tea-making set, "Sunray" fires and the "Universal" washer.

Metropolitan Electric Supplies, Exchange House, Old Change, London, E.C.4.—A price list of conduit accessories and elements.

McMichael Radio, Ltd., 265, Strand, London, W.C.2.—A stereo sheet of advertising blocks and standard advertisements for appointed dealers.

British Insulated Cables, Ltd., Prescot.—A catalogue of trailing cables (M.103).

H. Wallwork & Co., Ltd., Manchester.—Leaflets dealing with worm gear.

Ateliers de Constructions Electrique de Charleroi, 56, Victoria Street, London, S.W.1.—A quarterly stock list of electrical equipment.

J.P. Tubular Heater Co., Ltd., Newarthill, Lanarkshire.—A leaflet showing a new convection heater and giving reduced prices of tubular heaters.

Renold & Coventry Chain Co., Ltd., Renold Works, Didsbury, Manchester.—A leaflet showing the application of chains for driving at short centres.

Private Arrangement

G. Hopkinson, radio engineer, 84, Derby Road, Chesterfield.—The creditors were called together recently at Sheffield, when a statement of affairs was submitted showing liabilities of £480, and in addition there were fully secured creditors for £42. The net assets were £147, leaving a deficiency of £333. It was decided that the debtor should be allowed time in which to find a sum sufficient to pay a composition of 6s. 8d. in the £ to the creditors.

Bankruptcy Proceedings

E. H. Armitage, 20, Green Lane, Cookridge, Leeds, lately trading in co-partnership with another as an electrical factor.—The public examination herein was adjourned for formal closing on October 25th at the County Court House, Albion Place, Leeds. Debtor, who had a deficiency of £547, attributed his present position to insufficient income to meet unexpected claims in connection with the late partnership, and bad trade.

J. A. Sutcliffe, Main Street, Bolton-le-Sands, Lancs, electrician and wireless dealer, &c.—The public examination herein was held at the Sessions Hall, Lancaster Road, Preston, recently, and according to the statement of affairs filed there was a deficiency of £425 on ranking liabilities of £775. Debtor attributed his failure to lack of capital, underestimating, and inexperience. The examination was adjourned for closing.

A. H. Estall, electrical contractor, 20, Thackeray Street, Kensington, W.8.—Last day for receiving proofs for dividend November 11th. Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, London, E.C.2.

W. N. Smith, radio dealer, 18, King Street, Dudley.—Last day for receiving proofs dividend November 12th. Trustee, Mr. K. V. Hooper, 1, Priory Street, Dudley, Official Receiver.

J. W. Colleer, radio dealer, 3, Heybridge Street, Heybridge, Maldon.—First and final dividend of 2s. 4¾d. in the £, payable November 7th at 29, Russell Square, London, W.C.1.

C. J. C. Etchells, electrical and radio dealer, 8, Jedburgh Street, Middlesbrough.—First and final dividend of 1s. 10½d. in the £, payable at 80, High Street, Stockton-on-Tees.

J. W. Harrison, radio engineer, 29, Midland Street, and lately carrying on business at 349, Hessle Road, and 67, Porter Street, Hull.—Public examination November 21st at the Guildhall, Hull.

Company Liquidations

Magnaphone, Ltd., 187a, West End Lane, West Hampstead, London, N.W.6.—At the statutory meeting of the creditors a statement of affairs was submitted showing liabilities of £2,038, of which £1,751 was due to the trade and the balance to cash creditors. The net assets were £1,343, leaving a deficiency of £495. The creditors decided to confirm the voluntary liquidation of the company with Mr. F. E. Bendall, of Bendall, Poppleton & Appleby, 4, Charterhouse Square, London, E.C., as liquidator. A committee was also appointed.

G. W. Cross & Co., Ltd.—Meeting November 28th at Pinners Hall, Austin Friars, London, E.C.2. to receive an account of the winding-up by the liquidator, Mr. W. O. R. Head.

Eden Valley Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. R. R. Sowerby, Winton House, Kirkby Stephen, Westmorland.

Traffics Radio Syndicate, Ltd.—Winding up voluntarily. Liquidator, Mr. J. P. Griffiths, Merthyr House, James Street, Cardiff.

West Witton Electric Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. Lund, 235, Manningham Lane, Bradford.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

ELECTRIC toothbrush.

Electricity Supply

Lighting, Domestic, Power

Amble (Northumberland).—ELECTRIC PUMPING.—Application is being made for permission to borrow about £2,000 for electrical equipment for a pumping plant for augmenting the town's water supply.

Auchinblae (Kincardineshire).—STREET LIGHTING.—The ratepayers have decided in favour of a street lighting scheme to be undertaken by the Grampian Electricity Supply Co.

Barking.—YEAR'S PROFIT.—We regret that in our recent table of supply undertakings' results the annual profit was given as £174. This should have read £9,904, and £18,682 in 1936-7.

Berwick.—ELECTRIC STREET LIGHTING.—The Town Council has decided to include in its estimates the sum of £6,000 for electric street lighting.

Blackburn.—LIGHTING MAIN ROADS.—It is reported that the Street Lighting Committee has formulated a scheme for lighting the main traffic routes of the town at a cost of £24,000, a start on which will be made next year.

Bognor Regis.—NEW KIOSKS.—The Bognor Gas and Electricity Co. has recently erected 11-kV kiosks at Yapton Railway Gates, Ford and Ford Aerodrome. The 11-kV line feeding Arundel has now been dismantled and the cables placed underground, owing to the proximity of the new Ford Aerodrome, states Mr. H. A. Harding, the electrical engineer.

Bradford.—SIGNS OF TRADE IMPROVEMENT.—After a year of notable development the rate of increase in the Electricity Department's output slowed down considerably during the six months ended September 30th last, when it was much smaller than in any corresponding period since 1930. Had it not been for the extended use of electricity in domestic premises the output would have actually decreased. Based on the more recent monthly consumptions of a number of the Department's large power users, however, there are indications that in certain, if not all, directions, business is improving. In the year ended March 31st last the Department, of which Mr. T. Roles is engineer and manager, sold in its own area 165.1 million kWh. This represented an increase of 14.2 million kWh (9 per cent.) of which the special rate domestic supply accounted for 8.4 million kWh. The number of consumers rose by 8,534 to 65,842, and there was an increase in load connected from 46,846 kW to 293,758 kW. Owing to the unprecedented demand for cookers, kettles, water heaters, &c., it was decided temporarily to suspend the lecture-demonstrations in the outer districts, the Bolton Road Consumers' Department being taxed to the utmost. The following figures show the numbers of appliances connected at March 31st last, with the year's increases in parentheses:—Cookers, 9,907 (3,718); grillers, 2,565 (1,099); kettles, 21,509 (8,267); water heaters, 4,857 (1,136); and wash boilers, 5,136 (2,040). The 1937-38 revenue from the sale of electricity was £686,525, an increase of £44,041, the average revenue per kWh sold being 0.998d. The net profit was £19,691, an improvement of £2,362.

Brora (Sutherland).—ELECTRIC LIGHTING.—The streets are to be lighted electrically at a cost of £545.

Cheltenham.—BETTER LIGHTING.—The Electricity Committee is to improve public lighting at a cost of £690.

Chesterfield.—METERS.—The Electricity Committee is seeking sanction to borrow £10,000 for the purchase of meters and other equipment.

Crewe.—TARIFF INCREASE DEFERRED.—The Council has deferred consideration of a proposal to increase the electricity charges. The principal tariff changes proposed were an increase in the flat rate from 3½d. to 4d. per kWh, and under the domestic tariff an increase from ½d. to ¾d. per kWh, together with an increase from 2s. 6d. to 3s. per assessable room during the two winter quarters.

Croydon.—THERMAL STORAGE PLANT.—The Corporation is to install thermal-storage plant at the Queen's Road Homes at a cost of £2,500.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains in the Norbury area at a cost of £1,224 and provide an additional supply for Trojan, Ltd., Purley Way (£1,180).

Dundee.—ILLUMINATIONS.—The Lighting Committee is considering decorative lighting schemes for the British Association's visit to the city next year.

Exeter.—ELECTRIC KETTLE OFFER DISCONTINUED.—At a recent meeting of the Electricity Committee the electrical engineer stated that electric kettles were originally provided as part of the equipment of cookers because the hot-plates available were somewhat slow in operation. During the last three years most of the cookers had been fitted with a radiant hot-plate which made it unnecessary to supply the kettle. He recommended that the issue of electric kettles should be discontinued and that in their place plain flat-bottomed kettles should be provided. Consumers desiring to retain their electric kettles might do so provided they paid any maintenance charges. This was approved.

Fleetwood.—ELECTRICAL DEVELOPMENTS.—Included in the town's five-year plan is the expenditure of £67,000 for electricity supply, apparatus and buildings.

Glasgow.—HEATERS IN POLICE BOXES.—The Police Committee has asked the Electricity Department to install electric heating equipment in each of the 219 police boxes.

Guildford.—SCHOOL HEATING.—A proposal that electricity should be considered for heating the new senior school met with opposition at a recent meeting of the Education Committee. It was ultimately decided that alternative methods of heating should be considered before the plans are finally submitted to the Board of Education.

Hastings.—SUPPLY EXTENSIONS.—The Electricity Committee is to extend overhead lines and erect sub-stations at Northiam (£1,160) and Mountfield (£805). A main is to be laid from Broomgrove to The Grove at a cost of £7,450, and a larger transformer is to be installed at Crowhurst sub-station at a cost of £500.

Hursley (Hants).—ELECTRIC LIGHTING INSTALLED.—As a thank-offering for peace Sir George and Lady Cooper have installed a system of electric lighting throughout the village and a large part of the Hursley Park estate. More than 1,500 lamps have been provided.

Inverness.—PETITION FOR MORE PLANT.—A petition to be sent to the Secretary of State for Scotland appeals for powers to enable the Corporation to purchase and install additional plant necessary for the extension of the local electricity undertaking. The Electricity Commissioners recently refused to allow the Corporation to purchase additional plant, suggesting that a supply should be secured from the Grampian Electricity Co. The petitioners also ask the Secretary for Scotland for an assurance that any legislation introduced by the present Government will not give any privately controlled company power to acquire compulsorily the Inverness undertaking in view of the facts set forth in the petition. The total capacity of the undertaking's generating plant is 2,660 kW and the peak load recorded last December was 2,544 kW, leaving available standby plant of 116 kW.

Kettering.—SCHOOL INSTALLATIONS.—The electrical installation at the Henry Gotch elementary schools now being erected at Kettering will include wiring and points for vacuum cleaners, loud-speaker extensions, cinematograph, and electric clocks. This work is being carried out by the Electricity Department. The Education Committee is to inspect electric heating apparatus which has now been installed at Hawthorn Road school with a view to the adoption of similar equipment at other schools in Kettering.

Lancaster.—SUPPLY TO CONDER VALLEY.—Gratitude to the electricity undertaking for its policy of making supplies available in sparsely populated areas was expressed by several speakers when an extension to the Conder Valley was officially inaugurated last week. Mr. H. W. Grimmett, rural officer for the Electricity Commissioners, remarked upon the fact that the cabling was carried out complete so that all the villagers would get a supply. The scheme reflected great credit on the electrical engineer (Major G. C. Milnes) and his staff, he said. Captain Sanderson commented on the extension being by underground cables.

London.—FULHAM.—The first of the two up-river steamers recently ordered by the Borough Council for the transport of coal to the power station took the water on October 25th from the Burntisland shipyard after being named Fulham IV by the Mayoress of Fulham, Mrs. E. Cox.

POPLAR.—The Electricity Committee is to erect a sub-station in Hind Grove at a cost of £1,929.

Loughborough.—SUB-STATION.—It is proposed to erect a substation in Judge Street.

Manchester.—20,000TH HIRED COOKER.—To mark the occasion of the connection of the 20,000th electric cooker on hire the Electricity Committee recently presented a set of aluminium cooking utensils to the consumer at whose house the cooker was installed on September 30th. The presentation was made at the new electricity showrooms in the Town Hall extension on October 28th by the chairman of the Electricity Committee, Alderman R. W. Shepherd. In addition to the 20,000th hirer there were also present at the ceremony the consumers who hired the 10,000th cooker in June, 1932, and the first cooker in June, 1923. A small souvenir, in the form of a box of chocolates, was presented to all three ladies as a personal gift from the chairman and members of the Electricity Committee.

Shipley.—SUB-STATION.—The electrical engineer reports that owing to the increased demand of W. P. Butterfield (Shipley), Ltd., it will be necessary to erect a new sub-station at the company's works at Low Well.

Southend.—ILLUMINATIONS.—A statement has been made by a member of the Town Council that the illuminations are likely to be seriously curtailed or even abandoned next year.

Spenborough.—STREET LIGHTING.—A number of new electric street lamps are to be erected and several lamps replaced by mercury electric-discharge units.

Thornton Cleveleys.—ELECTRICAL DEVELOPMENTS.—Included in the Council's five-year plan is the expenditure of £40,000 on the development of the electricity supply.

Tiverton.—SUPPLY TO WASHFIELD.—The Exe Valley Electricity Co., Ltd., has been given permission to tap the Tiverton Council's high-voltage main in order to enable the company to extend its supply to Washfield. The terms are £4 15s. per kW of maximum demand per annum and 0.4d. per kWh, subject to coal price variation.

Warrington.—ELECTRICITY FOR WATERWORKS.—For a period of ten years a supply of electricity is to be obtained from the Mersey Power Co., Ltd., for the requirements at a proposed new waterworks at Helsby.

Watford.—ENGINEER'S REPORT.—In the 1937-38 report—his twenty-fifth—on the operations of the Electricity Department, Mr. A. W. Barham, the chief engineer and general manager, shows that, excluding the bulk supply to the "Northmet" Co., there was an increase of 12 per cent. in electricity sold, the total being 61.5 million kWh. An increase of nearly 12 per cent. in supplies for lighting is attributed by Mr. Barham largely to a general tendency to improve the standard of lighting in factories, shops and homes, and he feels that the E.D.A. campaigns have played an important part in this. Under the domestic rate 15.8 million kWh was sold, with the high average of 4,630 kWh per consumer and a record low yield of 0.60d. per kWh—the same as for power. The number of consumers added during the year was 2,795, and at March 31st 27,862 of the 36,709 premises in the area were connected, a percentage of 75.9. Actually the highest proportion of connections is in the Aldenham rural area, where 1,357 of the 1,621 premises are supplied, equivalent to 83.7 per cent. The net surplus for the year ended March 31st last was £26,938, against £27,812 in 1936-37.

Yorkshire.—NEW POWER STATION.—At a luncheon to members of the West Riding County Council last Monday Mr. W. B. Woodhouse, managing director of the Yorkshire Power Co., said that the company was planning a new power station, which would be its fourth. The new station would be in South Yorkshire.

Traction

Denmark.—TRANSPORT COMPARISONS.—Tram and new trolley-bus services at Copenhagen yielded a considerable margin of profit during the year ended October 1st, whereas the motor-bus services were operated at a loss of 126,000 kr. This may result in the complete withdrawal of motor-buses in favour of trolley-buses.

Glasgow.—NEW TRAMS.—The Transport Sub-Committee, after hearing a report by the general manager, has agreed

Recently the trams were withdrawn from a number of additional routes in North London. The photograph shows one of the new trolley-buses at the extension to the Waltham Cross terminus round Queen Eleanor Cross

to the construction of twenty-five trams, similar to the new type now running, at a cost of £3,500 each. The manager is to be asked to prepare a report explaining his reasons for recommending that the new trams shall be mounted on trucks instead of bogeys. The manager suggested that 125 semi-high-speed trams should be replaced at a total cost of £312,500. Another suggestion was that half the present fleet, representing approximately 500 cars, should be fitted with new bodies on trucks at an estimated cost of £1,500 each. This would involve an expenditure of £750,000.

New Zealand.—TRANSPORT IN WELLINGTON.—The passenger transport services in the capital are principally operated by trams, of which the Corporation owned 197 at March 31st last. According to the annual report of the general manager, Mr. M. Cable, these earned an average of 24.00d. per vehicle-mile run, with working expenses of 18.55d. Motor-buses, of which the Corporation has 27, brought in 15.30d. per vehicle-mile and the working expenses were 19.92d., so that not only were they operated at a substantial loss but cost more to run per vehicle-mile than the trams. The price per kWh for the traction supply was 0.75d.

Sweden.—INTRODUCTION OF TROLLEY-BUSES.—The first trolley-bus service in the country is to be inaugurated shortly at Vasteras, where tests are to be carried out with an all-Swedish single-decker seating sixty passengers which has been designed by engineers of the "Asea" works. The same type of trolley-bus will be used by a Stockholm company which has been granted a concession to operate a new service, and the municipal transport undertaking at Stockholm is planning to convert several tramcar and motor-bus services to trolley-bus operation. The municipal undertaking at Gothenburg has also decided to introduce a trolley-bus service on an existing motor-bus route, and the sum of 500,000 kr. has been granted to cover the cost of conversion.

Communications

Norway.—NEW TRANSMITTER.—The Government has placed a contract with Marconi's Wireless Telegraph Co., Ltd., for the supply and installation of a 100-kW Class B medium wave transmitter at Stavanger. It will be housed in a building where in 1918 the Marconi Co. installed, for the Norwegian Telegraph Administration, a long wave timed-spark telegraph transmitter for communication with the United States, and the new equipment will strikingly demonstrate the progress made in radio design in two decades.

Sweden.—RADIO CONTROL FOR SHUNTING.—A new system of radio signalling for shunting has recently been brought into use by the Swedish State Railways at Malmö. The system, which has been designed and constructed by the AGA-Baltic Radio A/B in consultation with the railway signalling department, was evolved on account of the difficulty of placing the ordinary optical signals in satisfactory positions. On the locomotive there are a receiving set and a signal board with a loudspeaker. The receiver is equipped with a number of selective relays tuned to correspond with the different tone frequencies of the transmitter, so that when a signal of a certain tone is sent out from the transmitter a similar signal relay in the receiver causes a corresponding signal lamp to light up. The light signal is given in the form of textual messages on an opaque window on the signalling board. The transmitter, which is mounted in a special box, is constructed for wavelengths between 1,000 and 2,000 metres, and the overhead high-voltage electric railway traction system serves as an aerial. By means of press-buttons the signal "stop" can be given from several places in the yard. The transmitter is also provided with a telephone by which the shunting superintendent can give the engine driver oral orders or information if necessary.

Turkey.—NEW BROADCASTING STATION.—The new British-built broadcasting station erected at Ankara at a cost of £300,000 was officially inaugurated last Friday by the Premier, M. Jelal Bayar. The inauguration coincides with the celebrations commemorating the fifteenth anniversary of the Turkish Republic, states *Reuter*.

Supply in the Home Counties

WHILE the latest report of the proceedings of the London and Home Counties Joint Electricity Authority covers the twelve months to the end of March last the accounts are for the nine months to December 31st, 1937, due to a change in the financial year. In this period the total revenue was £677,216 and the gross revenue surplus £188,357. After charging interest, &c., the excess of expenditure over income was £85,948. With the deficit of £617 brought forward this makes £86,565, against which is set £18,000 estimated income for electricity sold but not invoiced, leaving an adverse balance of £68,565. It has to be borne in mind, however, that approximately 75 per cent. of the annual expenditure is charged against revenue for a period which includes two summer quarters, with their lower yield.

Capital expenditure on the extension of the Authority's local distribution undertakings during the nine months amounted to £305,960, which was financed out of accumulated sinking funds and borrowings by way of mortgage loans and from the superannuation fund. At the end of last year the amount outstanding in respect of mortgage loans was £848,008. Provision for the repayment of loan debt totalled £842,636 and loans repaid amounted to £54,091. The sum of £708,153, part of the redemption fund, has been utilised for new capital purposes. The total capital expenditure of the Authority for all purposes at the end of last year was £5,388,902, and on local distribution account £5,134,323 (£2,077,243 for acquisition of undertakings and £3,057,080 for extensions).

With regard to the estimates for the current year, the report states that at the end of the period under review discussions were in progress between the Authority and the Commissioners upon a number of questions relating to these. It will be remembered that as a result the Authority recently decided to increase its prices.

In 1937 the Authority supplied seventeen undertakings with 513.5 million kWh in bulk (including 4 million kWh to Guildford under a new agreement dated January 1st, 1937) as compared with 455.5 million kWh in the previous year. The net bus-bar maximum demand increased from 158,424 kW to 188,763 kW.

There was a growth of nearly 15 per cent. in kWh sent to feeders for the Authority's local distribution undertakings during the year ended March 31st last, as compared with 20 per cent. in 1936-37, while the kW connected increased by 35 per cent. and the number of consumers by 7 per cent. Details of the supplies to these undertakings are given in the following table.

District.	Million kWh to feeders. Year ended March 31st.		Maximum demand (kW). Year ended March 31st.		kW connected. At March 31st.		Number of consumers. At March 31st.	
	1937.	1938.	1937.	1938.	1937.	1938.	1937.	1938.
Dorking ...	6.5	7.7	2,200	2,555	19,822	21,963	5,426	5,825
Leatherhead	11.0	12.1	3,869	4,317	28,397	33,020	7,207	7,976
Surbiton ...	14.8	17.3	5,865	6,380	51,590	60,288	12,949	14,070
Sutton ...	56.0	64.7	19,425	22,670	106,256	186,336	51,158	54,549
Twickenham	43.9	49.7	14,210	17,280	110,870	128,027	35,037	37,575
Weybridge .	2.3	2.4	904	1,014	5,451	5,704	1,950	2,001
Totals ...	134.5	153.9	46,473	54,216	322,386	435,338	113,727	121,996

In all, the undertakings cover an area of 121,500 acres with a population of approximately 460,000 and 128,000 premises.

No fewer than 96,154 of the 121,996 consumers at March 31st were paying for their supplies under two-part tariffs and 16,383 had assisted wiring installations. Cookers on hire increased from 19,669 to 24,257, wash-boilers from 3,818 to 5,128, water-heaters from 3,097 to 4,482, irons from 6,700 to 8,894 and kettles from 18,750 to 23,175. Refrigerators sold on deferred terms numbered 416 against 223 in 1936-7. Approximately 92 miles of mains were laid against 105 in the previous year. There were further extensions of electric street lighting, the number of lamps connected increasing from 10,452 to 11,695.

During 1937 the Authority suggested that the Commissioners should promote an Order authorising the transfer to the J.E.A. of the purchase rights vested in local authorities over the undertaking of the Uxbridge and District Supply Co., Ltd., but the Commissioners were not willing to do so on account of the Government's reorganisation of distribution proposals. In view of the delay in the introduction of legislation the J.E.A. has since asked the Commissioners to give further consideration to the matter.

London Transport

Conflict of duty

AT the end of June the London Passenger Transport Board, which has the general responsibility for providing an adequate and co-ordinated passenger transport system in an area of nearly 2,000 square miles with a population now not much less than ten millions, had been in existence five years and its work during this period is reviewed in the Board's annual report published last week. Possibly in the nature of an explanation of the failure to pay the full statutory interest on the " C " stock, emphasis is laid on the increasingly onerous burden of taxation and also the general rise in the level of prices. Thus fuel and licensed vehicle duty for the Board's buses and coaches alone in the past year came to £1,955,000, and the total rates, taxes (not income tax) and duty payments have risen in the five years by £276,006 to £2,770,233. Further, there has been a sharp rise in the prices of fuel. Taking the 1933-34 average prices as 100, the cost of petrol (excluding duty) last year was equal to 136, heavy oil (excluding duty) to 129 and coal to 132, the latter causing a marked increase in the cost of electricity for the railways, trams and trolley-buses. The result of these factors, and of wages adjustments, has been that working expenses have advanced slightly more proportionally than traffic receipts in spite of economies in operation. Last year the Board's passenger receipts, after the operation of the pooling scheme with the main line railways, were £30,758,440 against £30,077,161 in the previous year, and working expenses were £24,888,040 as compared with £24,210,864. Taking 1933-34 as 100, last year's receipts were equal to 113.3 and working expenses to 113.5.

On the general financial structure of the Board, it is pointed out that this would seem to preclude schemes of improvement however desirable they may be if they should result in such a burden as would hinder the Board in meeting the statutory charges. Yet the growth of London seems to compel the acceptance of a policy of development and sets up a conflict of duty.

The number of passenger journeys originating on the Board's system during the past year was 3,723.6 millions, or 87.3 millions more than in the previous year when, however, travel was affected by the bus strike. The traffic was distributed between the various forms of transport as follows, in millions of journeys :—Buses and coaches, 2,167.3; trams, 700.9; railways, 487.7; and trolley-buses, 367.7. Compared with two years ago—traffic in the intermediate year being disturbed by the strike—the proportion of bus and coach journeys remains at 58 per cent. of the whole and railway journeys at 13 per cent., while tram journeys have dropped from 27 to 19 per cent. and trolley-bus journeys have risen from 2 to 10 per cent. The total number of passenger journeys covered by the pooling scheme in the year under review was 4,318 millions, or 441 journeys per annum per head of the population.

Other statistics given in the report show that at June 30th the route miles run over by the Board's trolley-buses totalled 198 compared with only eighteen three years ago. The number of the Board's trolley-buses rose in the past year from 594 to 1,026, the trams decreasing from 2,060 to 1,668. A table dealing with electricity supply gives the number of kWh for running, lighting and heating trains, trams and trolley-buses as 654.8 million compared with 643.5 million in the previous year, and total supplies increased from 722.5 million kWh to 735.8 million kWh, the cost per kWh (low-voltage) rising from 0.515d. to 0.535d.

Extensions and improvements resulted in the Board's incurring a further £7,513,577 of capital expenditure during the year, raising the total to £131,281,061. Of the increase £4,750,425 was on railways, £1,627,629 on trolley-buses, and £433,497 on improvements in electricity supply.

Referring to the abatement of noise on the tubes, the report states that 6½ miles of tunnel has been treated and work will shortly commence on other sections.

Fire Precautions at Isleworth

A PERMANENT installation of fire-fighting apparatus has just been completed at the electricity works of the Borough of Heston and Isleworth. After consultation with H.M. Senior Electrical Inspector of Factories and the Electricity Commissioners, the borough electrical engineer and manager, Mr. S. H. Fowles, decided to install two types of apparatus, both operated in conjunction with an automatic audible and visual indicating alarm system.

The primary 22-kV bulk supply switchgear and cable trenches have been protected by means of a CO_2 gas installation (Pyrene Co., Ltd.) actuated by fusible links which are arranged to melt at a temperature of 155 deg. F. This releases weights arranged to pull down a system of levers, releasing compressed CO_2 from twelve cylinders into distribution piping which discharges the gas into the affected switch chambers. At the same time, as the automatic device comes into operation, asbestos blankets are caused automatically to drop over the windows of the 22-kV switchroom, thus minimising the escape of gas through them should they be blown out by the fire.

There are six main step-down transformers, the latest of which, now being erected on site, is a 22/11-kV Ferranti unit of 12,500 kVA with forced cooling. These and the 11-kV local distribution switchgear have been protected by " Mulsifyre " equipment (Mather & Platt, Ltd.) with water jets specially designed to create a high-velocity spraying effect. This breaks up escaping oil into small globules, which become so coated with water as to minimise the evolution of ignitable oil vapour.

The supply of water is obtained from an overhead tank of 10,000 gallons capacity through a 6-in. lagged pipe. To augment the pressure a DC motor-driven pump has been installed, nominally rated at 65 HP for 500 V. It is driven from the station battery and compounded in such a way as to furnish full output with a speed variation of 1,600 to 1,700 RPM, according to the degree of discharge of the battery, the use of which provides pumping energy under all conditions of emergency.

The pumping motor is brought into action by fall of pressure in the water-distributing system. A diaphragm valve closes the main switch, while the rotation of the motor shaft lowers the blades of a liquid starter controlling the necessary rheostat.

The pump discharges through a water filter into piping supplying numerous spray nozzles. To guard against the possible freezing of the water during the winter in that section of the piping which protects the outdoor transformers, the exposed pipe lines are normally filled with compressed air by means of a small motor-driven compressor. The automatic " Mulsifyre " detectors consist of small quartz tubes, the contents of which expand when heated. This causes fracture of the quartz, allowing the compressed air to escape from the pipes and water to flow through the spray nozzles.

The complete installation has cost £2,892, a fraction of the value of the plant it protects, apart from minimising danger to the station staff.

Are Loan Periods Long Enough?

RECENTLY the Poplar, E., Electricity Committee discussed the periods attaching to loan sanctions of the Electricity Commissioners for meters, domestic apparatus and change-over work, which at present are ten, seven and seven years respectively. It was felt that under modern conditions of meter testing and repairing the life of a meter was at least twenty years and it was considered that loan sanction should cover this period. Ninety per cent. of the Department's expenditure on domestic apparatus is confined to cookers, and the Committee considered that loan sanction for this expenditure should cover at least twelve years. With regard to the change-over the work of installing plant such as motors, cables, &c., on the various jobs could be considerably accelerated if the loan period were extended to, say, twenty years. The Committee considered that representations should be made to the Electricity Commissioners for a revision of these loan periods and that the Metropolitan Borough Councils which own electricity undertakings should be asked to give their support.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Tungstone Products, Ltd.—Private company. Registered October 27th. Nominal capital, £65,000. Objects: To acquire that part of the business of the late W. Haddon, carried on as the Tungstone Die Casting Co. at London and Market Harborough, and the British trade marks "Tungstone"; and to carry on the business of engineers, woodworkers, electricians, manufacturers, retailers and factors of engineering and electrical appliances of all kinds, &c. The directors are: W. Haddon, "The Limes," Clipstone, Market Harborough, and H. T. Appleton, "Woodhays," Cheyne Walk, Croydon (both directors of J. Haddon & Co., Ltd.). Registered office: 10, Salisbury Square, E.C.4.

Fitzgerald & Co. (Cork), Ltd.—Private company. Registered in Dublin October 26th. Capital, £10,000. Objects: To acquire the business of electrical engineers and wireless dealers now carried on by J. Fitzgerald, P. Fitzgerald and G. Buckley, at 74, Grand Parade, Cork, as Fitzgerald & Co. The directors are: J. Fitzgerald, Villa Ronan, Glasheen Road, Cork, G. Buckley, 2, Eglinton Place, Western Road, Cork, and P. Fitzgerald, Stuart House, Cobh, County Cork. Secretary: P. Uniacke, 4, Lapps Quay, Cork.

Electro (Norwich), Ltd.—Private company. Registered October 25th. Capital, £1,000. Objects: To carry on the business of dealers in electrical goods, wireless accessories, &c. The permanent directors are: R. G. Lawrence (chairman), Necton, Swaffham, and C. Carter, Bridge House, Brandon, Suffolk.

James McKenzie, Ltd.—Private company. Registered October 28th. Capital, £10,000. Objects: To carry on the business of electrical, wireless and mechanical engineers, contractors and merchants, &c. The directors are: J. McKenzie (chairman and permanent director) and Mrs. E. H. McKenzie, both of 9, Slatey Road, Birkenhead. Registered office: 27-29, Grange Road West, Birkenhead, Ches.

E. Lawrence (Engineers), Ltd.—Private company. Registered October 28th. Capital, £1,000. Objects: To acquire the business of a wireless dealer heretofore carried on by E. Lawrence at 154a, Hallgate, Cottingham, and 12, Toll Gavel, Beverley, E. Yorks. The directors are: E. Lawrence, Hallgate, Cottingham, E. Yorks, and H. A. Lawrence, Hillcrest, Fairfield Avenue, Kirk Ella, E. Yorks. Registered office: 154a, Hallgate, Cottingham.

James Barry & Sons Electrical, Ltd.—Private company. Registered October 20th. Capital, £500. Objects: To carry on the business of manufacturers and merchants of and dealers in sewing machines and all apparatus, wireless manufacturers, cabinet makers, furniture manufacturers, general electrical engineers, and to sell on deferred terms sewing machines and general electrical requisites, &c. The directors are: J. J. Barry, C. W. Barry and J. F. Barry, all of 73, Normanshire Drive, Chingford, E.4. Registered office: 522, Kingsland Road, Dalston, E.8.

T. H. McGlynn, Ltd.—Private company. Registered October 20th. Capital, £1,000. Objects: To acquire the business of a plumber, electrician and specialist in all systems of lighting, cooking and heating, carried on by T. H. McGlynn at 1 and 3, Sefton Street, and McGlynn Buildings, Queen Street, Blackpool. The directors are: T. H. McGlynn, 26, South King Street, Blackpool, and three others. Registered office: 1, Sefton Street, Blackpool.

Finlay's Radio, Ltd.—Private company. Registered October 26th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in radio, television, electrical and telephone apparatus, &c. The directors are: S. H. Finlay and Mrs. E. L. Finlay, both of 130, Morton Way, Southgate, N.14. Registered office: 406, Bethnal Green Road, E.2.

Slade's Radio, Ltd.—Private company. Registered October 27th. Capital, £500. Objects: To carry on the business of dealers in radio, television, gramophones, musical instruments, &c. The directors are: E. A. Slade and E. L. Slade, both of 62, Gardenia Road, Bush Hill Park, Enfield. Registered office: 59, Broadway Market, London Fields, E.8.

Plastics (Glasgow), Ltd.—Private company. Registered in Edinburgh October 27th. Capital, £5,000. Objects: To carry on the business of manufacturers, exporters and importers of and dealers in plastic moulding materials, moulds and moulded containers, utensils, appliances, &c. The subscribers are: J. M. Ferguson, 128, Carsaig Drive, Glasgow, S.W.2, and J. Kelly, 19, Purdie Street, Burnbank, Hamilton.

Returns of Electrical Companies

Statements of Capital

St. Helens Cable & Rubber Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 7th, 1938. 84,000 shares taken up. £84,000 paid. Mortgages and charges nil.

Rochdale Community Radio, Ltd.—Capital, £10,000 in 9,500 preference shares of £1 and 10,000 ordinary shares of 1s. Return dated July 20th, 1938. 4,800 preference and 10,000 ordinary shares taken up. £4,263 paid on 3,763 preference and 10,000 ordinary shares, £1,037 considered as paid on 1,037 preference shares. Mortgages and charges at date of return £282 (since paid off).

Plant Maintenance, Ltd.—Capital, £1,000 in £1 shares. Return dated August 13th, 1937 (filed October 22nd, 1938). 300 shares taken up. £300 paid. Mortgages and charges nil.

Rawlings Brothers, Ltd.—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1. Return dated August 11th, 1938. 21,903 preference and 61,401 ordinary shares taken up. £83,304 paid. Mortgages and charges nil.

Pope's Electric Lamp Co., Ltd.—Capital, £25,100 in 25,000 preference and 100 ordinary shares of £1. Return dated July 7th, 1938. 23,579 preference and 100 ordinary shares taken up. £5,254 paid, £18,425 considered as paid. Mortgages and charges nil.

Mortgages and Charges

N.S. Accumulators, Ltd.—Issue on March 6th, 1930, of £1,000 debentures, part of a series already registered. (Particulars of issue filed October 9th, 1938.)

Particulars filed of £2,000 debentures, authorised December 22nd, 1937, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being issued on September 28th, 1938.

Satisfaction in full on or before May 20th, 1936, of debentures authorised November 28th, 1929, and registered December 30th, 1929, securing £1,500. (Notice filed October 19th, 1938.)

F. W. Lechner & Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated October 12th, 1938, to secure £250. Holders: Southend Dairies, Ltd., 76, Finsbury Pavement, E.C.

Automatic Internal Telephones, Ltd.—Issue on September 26th, 1938, of £1,000 debentures, part of a series already registered.

Aish & Company, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 12th, 1938, to secure £10,000. Holders: Branch Nominees, Ltd.

W. H. Dean & Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 1st, 1938, to secure £2,000. Holders: W. P. Hughes & Co., Ltd., 41, Haven Green, Ealing, W.

Bennett & Channon, Ltd.—Particulars filed of £400 debentures, authorised August 16th, 1938, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being issued on September 30th, 1938.

Reports and Dividends

Ferranti, Ltd., held their annual meeting on October 28th, when Mr. V. Z. de Ferranti (chairman and managing director), who presided, said that the year under review had been one of expansion of the company's activities. The turnover of their normal products of electrical plant and apparatus had been increased, both in the home and export markets. There had also been a substantial increase so far as turnover was concerned in their efforts to assist the Government to accelerate the supply of armaments and special requirements for its defence programme. Their two subsidiary companies in Canada and the United States continued to be well employed and had again made profits which had been retained in their respective accounts. They had spent £38,244 on additional land and buildings to provide a much-needed extension at the Hollinwood works and the completion of the new works at Moston in connection with Government contracts. The unexecuted orders in hand at the commencement of the present financial year were still considerable, the falling-off of those for ordinary commercial products having been largely offset by an increase in those for the defence programme of the Government. Further capacity was available should greater demands be made upon them for work of a like nature.

Joseph Lucas, Ltd., held their annual meeting on October 26th, when Mr. P. F. Bennett (chairman and joint managing director) said that the balance sheet presented at the last meeting covered a record year, and up to the time of that meeting the figures had been maintained in spite of certain indications that trade activity was slowing down. From that time onward, however, there was a steady decline in business generally both in this country and in almost all overseas markets, and later when there appeared to be signs that an improvement had set in the acute international crisis arose. In the circumstances, the figures now presented were very good, and if international relations should steadily improve, they might look for an upward development in business as confidence returned to the world. C.A.V.-Bosch had a most successful year, and being engaged in the heavy transport side of the industry its turnover kept up even when that of some other departments fell. Its year ended in March, and consequently its contribution to the profits was substantial, as at that date it had not experienced any setback. Since then the falling-off in industrial activity had affected that concern.

Herbert Morris, Ltd., held their annual meeting on October 28th when Mr. W. H. Purnell (chairman), who presided, said that during the year under review their works had been occupied continuously, and they had the benefit of the extension to the North works. This had helped them to increase their output substantially and so to earn increased profit, although the output could have been greater had more skilled operatives with experience of their class of work been available. They had a satisfactory order book which would provide them with work for many months to come. Although their overseas market was not considerable, it had recently not been responsive to the extent they would like. There was some improvement, but monetary restrictions and adverse exchange in many countries made business exceedingly difficult. Strong efforts were being made to develop their business abroad.

Max Stone, Ltd.—Presiding at the annual meeting held on October 28th Mr. S. Walton (chairman) said that Stores Trust, Ltd., which administered their hire-purchase business had had a successful year, and a satisfactory surplus had been placed

to reserve against hire-purchase agreements. During the year under review the radio trade as a whole suffered somewhat severely, but the turnover in their business was more than maintained and profits were increased. Not only were they engaged in the radio and television trade, but they also had other important activities, including electric lighting and electrical equipment of every kind. Developments in that field held promise, and fuller rewards in the shape of profits should accrue in due course.

Burco, Ltd., reports a profit of £53,829 for the year ended September 30th as compared with £37,221 in the preceding year, from which are deducted directors' fees, income tax, N.D.C. and depreciation, leaving a net profit of £33,452, to which is added £6,126 brought in. An additional sum of £1,547 is placed to depreciation, tax reserve receives £3,000, general reserve £2,500, and it is proposed to pay a final dividend of 12½ per cent., making 20 per cent., less tax, plus a bonus of 2½ per cent., less tax, and to carry forward £10,207.

Allgemeine Elektrizitäts Gesellschaft.—The Berlin correspondent of the *Financial Times* states that the annual report laid before the supervisory board of the A.E.G. at its meeting on October 27th shows that the turnover of all departments expanded, and the volume of orders was higher than in the preceding year. Export sales were good.

The Superheater Co., Ltd.—Particulars were published on Wednesday last for information only of the Superheater Co., which will henceforth be in the hands of a new public company with the same name. Application is to be made to the Stock Exchange for permission to deal in the preference shares. The authorised capital of the new company is £450,000, all of which has been issued except 75,000 of the 120,000 "A" ordinary 5s. shares.

The British Electric Traction Co., Ltd., has declared an interim dividend of 2½ per cent. on the deferred ordinary stock.

The Adelaide Electric Supply Co., Ltd., is paying a final dividend of 5 per cent., tax free, making 10 per cent. for the year (same).

The Radio Corporation of America has declared a dividend of 20 cents per share on the common stock. This is the same as for 1937.

Glenfield & Kennedy, Ltd., have announced an interim dividend of 5 per cent. (unchanged).

Meters, Ltd., is paying an interim dividend of 2½ per cent. (same).

The Southern Areas Electric Corporation, Ltd., announces an interim dividend of 2 per cent. actual, less tax (unchanged).

Johnson & Phillips, Ltd., have declared an interim dividend of 5 per cent. (unchanged).

The Atlas Electric & General Trust is paying an interim dividend of 3½ per cent., on the 7 per cent. cumulative preference shares.

The Kalgoorlie Electric Power & Lighting Corporation, Ltd., is maintaining its interim dividend at 3 per cent.

Stocks and Shares

TUESDAY EVENING.

THIS week's Parliamentary debate, prior to the reopening of Parliament next week, imposed in advance something of a cautious tendency upon various markets round the Stock Exchange. The public are obviously anxious to know more details of what the probable expenditure will be in connection with the rearmament programme. Still greater interest is taken in the Government's attitude towards foreign politics. People admit, frankly enough, that they do not feel disposed to utilise at present the money which they would, in the ordinary way, be investing in stocks and shares. Investment prefers to wait until the atmosphere, charged just now with uncertainty, clears to some extent.

The success of a big Woolworth issue on Tuesday in this week has been hailed as a clear indication of the public's willingness to take good shares when offered at a reasonable figure. To what extent the heavy application was due to stag anticipations of snatching a quick profit, it is, of course, impossible to say, but that this factor had some influence over the subscription, there can be little doubt.

Shares in the iron, steel and allied companies continue in favour, and the market in them shows notable activity. The American outlook is, for the moment, bounded by what is likely to be the result of the Congressional elections to be held in the United States next Wednesday. Evidence of improvement in American trade helps to maintain the cheerful feeling which is, with occasional reactions, the prevailing feature of the market.

London Transport Report

No annual meeting of stockholders is held by the London Transport Board, but its report is detailed enough to leave few questions unanswered. On this occasion the figures and explanations come in for especial scrutiny because of the Board's failure to pay the statutory 5½ per cent. dividend on the "C" stock. Presumably the larger stockholders will have been waiting for the full results before making up their minds on the question of exercising the right to apply for a receivership. A million pounds rise in working expenses explains the disappointing results: this is the gulf in which the £676,000 gain in traffic receipts has been swallowed. It is possible that the "C" stockholders may find themselves at variance with the claim that the financial results of five years' working are satisfactory. Interest is awake to see whether they will take practical steps in the matter. The price of the stock, at 76, has fallen a point since publication of the report.

Calculated on the last dividend of 4 per cent., the yield on London Transport "C" stock at 76 is 5¼ per cent. On a 5½ per cent. dividend, the return would be more than 7 per cent. The present price suggests a feeling of doubt as to the chance of net revenue rising within a reasonable time, to the level contemplated in the Act. Optimism has to rely largely on fares being increased in the London area—a matter said to be now under discussion with the main-line companies. It is reckoned that if fares were put up 2½ per cent., the extra receipts would cover the amount required to bring the "C" stock dividend to 5½ per cent. The calculation assumes, of course, that passenger traffic would not be discouraged by extra charges. Complications enter in also on account of the triple character of the Board's obligations: it has to pay a proper share of respect to the public, the staff and the stockholders. The last-named may be feeling that their share of consideration has so far fallen short of a fair mark.

Industrial Markets

While still in the dark as to how the magnified defence programme will be financed and put into effect, interest in industrial shares is not venturing far beyond those most directly concerned with armaments. Some sections of the market are neglected. They are expected to remain so until it is known where the expected taxes are to fall, and at which points the pressing Government orders may be allowed most to disorganise everyday business. Caution is by no means unmixed with hopefulness, on the grounds that the extra Government expenditure will fill many gaps in order books at present somewhat thin by reason of the setback in trade. Also, industrial ordinary shares stand to do well in the period of inflation which some economists think the country is facing. Meanwhile, the absence of speculation has left the market in good trim to weather further uncertainty, or, as the case may be, to respond to better news. That holders of good shares feel little disposition to realise their investments at present prices is evidenced by the difficulties which buyers find in satisfying their larger wants.

Equipment and Manufacturing

Circumspect buying of industrial shares has not left the electrical equipment market out of account. Among the leading shares, General Electrics hardened to 77s., but others were little more than steady, Callenders and Crompton Parkinsons, for instance, being unchanged at the prices to which they advanced in the previous week. English Electrics have been bought on dividend prospects, and are 1s. higher at 30s. 6d. Ever Ready, at 21s. 9d., are also active and stronger. Dullness in Telegraph Constructions, at 2½, is exceptional. British Thermostats, with an advance of 1s. 3d. to 12s. 6d., are outstanding among the smaller companies. Electrical Switchgear, at 26s. 3d., Hall Telephones, at 20s., Revo Electrics, at 35s., and Allen Wests, at 5s. 9d., are other cheerful spots. A number of shares in the more general engineering concerns show useful gains. These include Murex, at 76s. 3d., Mather & Platt, at 47s., Greenwood & Batley, at 26s. 3d., and International Combustions, at 5¼.

Electricity Supply

Apart from falls of 1s. 3d. each in the shares of Midland Counties, North Metropolitans and Electrical Distribution of Yorkshire, the home electricity supply group has continued to mark time. As usual, the market has one eye on the prospects for trade and industry, and the other on the movement of gilt-edged prices. Because of the comparative stability of their dividend payments, electricity supply shares feel the direct influence of matters which have a bearing on British Government securities, and of fixed-interest stocks in general. For the time being, the latter are overshadowed by the double cloud of increased taxation and of fresh Government borrowing. Price movements are livelier in the overseas group, where Calcuttas are particularly strong at £2. Tokyo 6 per cent. bonds have been advancing in step with the Japanese armed forces, and are now up to 59, or 20 points above the year's worst point. Palestine "A" shares, at 30s., have more than recovered a set-back to 28s. 9d. Victoria Falls are reactionary at 70s. Atlas Electric 7 per cent. preference have seen some activity at around 20s. 6d. on the payment in full of the half-yearly dividend. The new Scottish Power 4 per cent. preference shares are steady at 6d. premium over the issue price of £1.

Miscellaneous Matters

London Transport Board senior stocks showed themselves indifferent to the annual report. Tillings and British Electric Traction issues were also undisturbed by the evidence of the way in which the costs of transport have risen. London Electric Transport guaranteed 2½ per cent. stock has dropped a point to 90½. Central Electricity Board stocks are irregular, reflecting the uncertain behaviour of the gilt-edged market. Home railway stocks are keeping a firm front, largely because the expected increase of activity in the heavy industries should give a fillip to the traffic figures. Electric and Musical Industries shares are coming in for a revival of speculative interest. At 12s., the price is 1s. 9d. higher than a fortnight ago. Wall Street shows few signs of nerves at the approach of next week's elections: Cable and Wireless stocks are on the dull side, the ordinary, at 44, having fallen again to a point where the yield on the last dividend is over 9 per cent.

Electrical Companies' Shares

Prices, dividends and yields

Company.	1938. Highest.	1938. Lowest.	Dividend. Previous.	Dividend. Last.	Price Nov. 1.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.							
Bournemouth and Poole	68/3	62/–	15	15	67/6	—	4 8 7
British Power & Light	30/9	24/6	6	7	28/6	—	4 18 3
City of London	34/6	28/6	7½*	7½	31/6	—	4 15 3
Clyde Valley	42/6	33/–	8	8	35/9	—	4 9 4
County of London	51/9	38/9	10½	10½	46/–	—	4 11 5
Edmundson's:							
7% Pref.	33/3	30/–	7	7	31/3	–9d.	4 9 6
Ord.	40/9	18/9	9	9	26/–	+6d.	—
Elec. Dis. Yorkshire	43/6	37/9	9	9	41/3	–⅛	4 7 5
Elec. Fin. and Securities	51/9	49/–	12½	12½	50/–	—	5 0 0
Elec. Supply Corporation	55/–	50/–	12	12	53/9	—	4 9 5
Isle of Thanet	21/3	18/6	4	4	20/–	—	4 0 0
Lancs Light and Power	35/–	26/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	23/6	21/–	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric	32/9	28/–	7	7	30/9	—	4 11 4
London Electric	36/3	32/–	8	10	34/–	—	4 2 4
London Power Deb. Red.	108¾	100	5	5	105	—	4 15 3
Metropolitan	51/–	41/–	10	12	47/6	—	5 1 1
Midland Counties	39/9	33/–	8	8	36/3	–⅛	4 4 3
Mid. Elec. Power	41/9	37/–	8	9	40/–	—	4 10 0
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric:							
Ordinary	34/–	25/–	7	7	31/–	—	4 10 6
7% Pref.	34/–	30/–	7	7	32/–	—	4 7 6
Northampton	47/6	43/9	10	10	46/3	—	4 6 7
Notting Hill 6% Pref. (£10)	14	13½	6	6	13½	—	4 9 0
North Met. Elec.:							
Ordinary	49/–	43/–	10	10	46/3	–⅛	4 6 7
6% Pref.	30/6	28/3	6	6	29/6xd.	–6d.	4 1 4
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	36/3	—	4 8 2
Southern Areas	22/9	18/6	4½	5	21/3	—	4 14 1
South London	32/6	31/–	7	7	31/6	—	4 9 0
West Devon	23/3	21/3	5	5	1½	—	4 9 0
West Glos.	19/–	16/9	2	2	18/–	—	2 4 5
Yorkshire Elec.	42/–	36/9	8	8	40/–	—	4 0 0
Overseas Electricity Companies.							
Atlas Elec.	4/6	2/6	Nil	Nil	3/–	—	—
Calcutta Elec.	44/3	36/3	12*	10*	2	+⅛	5 0 0
Cawnpore Elec.	40/–	35/–	10	10	36/3	—	5 10 6
East African Power	28/3	22/6	7	7	24/–	–2/–	6 16 8
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7½	10/9	—	6 19 6
Madras	34/6	28/9	8*	8*	30/–	—	5 6 8
Montreal Power	31½	26¾	1½	1½	31½	—	—
Palestine Elec. "A"	31/9	27/–	7½*	7½*	30/–	+6d.	5 0 0
Perak Hydro-electric	25/3	17/–	7	6	20/–	—	6 0 0
Shawinigan Power	23½	16½	65cts.	85cts.	21½	—	—
Tokyo Elec. 6%	65½	39	6	6	59½	+2	10 3 4
Victoria Falls Power	76/3	55/–	12	13½	70/–	–¼	3 17 2
Whitehall Investments Pref.	22/3	15/–	7½	7½	17/6	–⅛	8 11 6
Public Boards.							
Central Electricity:							
1950–70	115¾	97	5	5	110½	—	4 10 6
1955–75	118½	100	5	5	113½	+1	4 8 1
1951–73	111	95	4½	4½	108½	–1	4 3 0
1963–93	101	85	3½	3½	96½xd.	—	3 11 10
London Elec. Trans. Gtd.	93½	88	2½	2½	90½	–1	2 15 3
London & Home Counties,							
1955–75	112¾	97½	4½	4½	110	+½	4 1 10
Lond. Passenger Transport:							
A	119½	110	4½	4½	115½	—	3 18 0
B	122¾	105	5	5	116½	—	4 5 10
C	84	68	4½	4	76	–1	5 5 3
West Midlands Joint Elec.,							
1948–68	115½	102½	5	5	110½	—	4 10 6
Telegraph and Telephone.							
American Tel. & Tel.	154½	114	9	9	155½	—	5 15 9
Anglo-Am. Tel.:							
Pref.	115½	103	6	6	103½	–1	5 16 0
Def.	28	24	1½	1½	23	—	6 10 5
Anglo-Portuguese	23/6	19/3	8	8	21/3	—	7 10 7
Cable & Wireless:							
5½% Pref.	104	84	4½	5½	88	–½	6 5 0
Ord.	67¾	36	—	4	44	–½	9 1 10
Income	102½	99	—	—	101	—	3 18 2
Canadian Marconi $1	6/6	3/9	—	Nil	5/3	—	—
Globe Tel. & Tel.:							
Ord.	32/6	27/6	5½*	7½*	27/6	—	5 9 1
Pref.	27/6	23/9	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)	42½	34/–	20	20	41	—	4 17 7
Marconi-Marine	30/6	21/6	10	7½	23/9	—	6 6 4
Oriental Telephone Ord.	59/3	2½	12*	12*	2¾	—	4 7 3
Radio Corpn.	8	4¼	8	6	9¼	—	—
Telephone Props	13/9	11/3	5	6	13/3	–6d.	9 1 2
Telephone Rentals (5/–)	10/–	7/6	5	7½	9/3	—	3 4 10
Western Union	34½	17	2¾	—	29½	–2	—
Traction and Transport.							
Anglo-Arg. Trams:							
First Pref.	11/–	2/6	Nil	Nil	3/9	—	—
4% Inc.	31	8	Nil	Nil	8	—	—
British Electric Traction:							
Def. Ord.	1060	675	5	5	950	—	—
Pref. Ord.	175	150	8	8	165	—	4 17 0
Bristol Trams	45/–	34/3	5	8	2	+⅛	4 0 0
Brazil Traction	14½	7½	70cts.	$1	12¾	+¼	—
Calcutta Trams	26/9	21/6	8	8	23/6	+6d.	6 16 2
Cape Elec. Trams	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	32/6	—	6 3 1
Mexican Light:							
1st Bonds	39	16½	5	5	20	—	—
Rio 5% Bonds	91	47	5	5	65	+2	7 13 9
Southern Rly:							
5% Prefd.	87	48	5	—	55½	—	—
5% Pref.	116	83	5	5	96½	—	5 3 10
T. Tilling	60/–	36/6	10	10	43/9	—	4 11 4
Tilling & B.A.	57/–	46/–	6	10	50/–	—	4 0 0
West Riding	46/3	30/6	10	10	32/6	—	—
Equipment and Manufacturing.							
Aron Electricity Ord.	40/3	31/–	15	15	1 11/32	—	8 17 6
Assoc. Elec.:							
Ord.	45/3	32/–	10	10	37/6	–6d.	5 6 8
Pref.	38/9	35/6	8	8	36/6	–6d.	4 7 8
Automatic Telephone & El.	43/–	35/–	5	10	41/3	—	4 17 1
Babcock & Wilcox	44/–	32/6	10	10	37/6	—	5 6 8
British Aluminium Ord.	54/–	40/–	10	12½	53/9	+9d.	4 13 0
British Insulated Ord.	95/9	77/–	20	20	4½	—	4 9 0
British Thermostat (5/–)	15/6	9/–	17½	18½	12/6	+¼	7 8 0
British Vacuum Cleaner	35/9	27/6	5	6	28/3	—	4 5 0
Brush Ord.	5/6	4/9	Nil	Nil	4/9	—	—
Callender's	5½	78/6	20	20	4 1/16	—	4 15 8
Chloride Elec. Storage	77/9	61/–	15	20	75/–	—	5 6 8
Consolidated Signal	116/–	75/–	30	36½	4½	—	8 2 0
Crabtree (10/–)	29/–	22/–	—	17½	23/9	—	7 7 6
Crompton Parkinson:							
Ord. (5/–)	32/3	18/9	12½	12½	26/3	—	—
E. K. Cole (5/–)	8/9	4/6	5	10	6/6	—	7 13 10
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	12/–	—	4 3 4
Electric Construction	36/–	31/–	10	12½	32/6	—	7 13 10
Enfield Cable Ord.	5 3/16	46/–	25	25	2½	—	—
Electrical Switchgear	26/3	22/6	5	5½	26/3	+½	4 3 10
English Electric	31/9	24/6	Nil	10	30/6	+1/–	6 11 2
Ensign Lamps (5/–)	14/3	11/3	—	25	14/3	—	8 16 0
Ericsson Tel.	2 3/16	31/–	25*	25*	2	—	3 2 6
Ever Ready (5/–)	26/3	16/6	45	35	21/9	+1/9	8 0 10
Falk Stadelmann	34/3	27/–	10	10	27/6	—	7 5 6
Ferranti Pref.	27/6	25/6	7	7	27/6	—	5 2 0
G.E.C.:							
Pref.	34/–	31/3	6½	6½	31/3	—	4 3 4
Ord.	79/3	67/–	17½	20	77/–	+6d.	5 4 0
Greenwood & Batley	25/6	19/–	7	15	26/3	+⅜	11 8 6
Hall Telephone (10/–)	24/6	18/3	5	15	20/–	+⅜	7 10 0
Henley's (5/–)	21/–	16/–	15	20	20/–	—	5 0 0
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12½	39/6	+9d.	6 6 7
India-Rubber Pref.	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5⅞	4½	5	30	5½	+⅛	5 17 2
Ismay Industries (5/–)	6/9	1/3	6	6	1/3	–3d.	—
J. Lucas	57/9	47/6	15	15	56/3	—	5 6 9
Johnson & Phillips	43/9	32/6	10	12½	37/6	—	6 13 4
Lancashire Dynamo	72/3	53/–	20	25	57/6	—	8 2 4
Laurence Scott (5/–)	12/–	9/–	7	15	11/3	—	6 13 4
London Elec. Wire	35/–	28/3	12	7½	28/9	—	5 4 2
Mather & Platt	49/–	41/3	12	13½	47/–	+9d.	5 15 0
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3	—	5 3 6
Murex	93/9	66/3	20	20	76/3	+⅜	5 5 0
Pye Deferred (5/–)	12/–	8/–	5	25	9/6	—	13 3 2
Revo (10/–)	36/3	30/–	12	17½	35/–	+⅛	5 0 0
Reyrolle	62/6	49/–	12½	12½	56/3	—	4 9 0
Siemens Ord.	31/–	20/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–)	6/–	4/–	5	5	4/9	+3d.	10 10 6
S. Smith (1/–)	9/9	6/3	37½	50	8/9	—	6 6 0
Switchgear & Cowans (5/–)	19/6	12/6	20	20	14/6	—	6 18 0
Telegraph Condenser (10/–)	18/9	12/–	5	5	12/6	—	4 0 0
Telegraph Construction	2½	36/–	7½	10	2½	–⅛	4 14 1
Telephone Mfg. (5/–)	9/9	7/–	9	9	8/9	—	5 2 10
Tube Investments	89/6	70/–	23¾	23¾	84/6	+⅛	5 12 6
Vactric (5/–)	9/9	5/9	10	10	5/–	–2/–	10 0 0
Vickers	27/–	17/6	10	10	24/6	–6d.	4 1 9
Westinghouse Brake	63/9	45/–	15	17½	54/–	+2/9	6 9 8
Walsall Conduits (4/–)	26/–	22/6	6½	55	23/3	—	9 9 8
West, Allen (5/–)	5/9	4/6	—	7½	5/9	+3d.	6 10 4

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

28. "Electric supply cables for vehicles and collectors therefor." H. V. Flinn. January 1st, 1937. (Cognate application 5011/37.) (493132.)

243. "Moving-contact current convertors." Siemens-Schuckertwerke Akt.-Ges. January 4th, 1936. (Cognate applications 244/37, 245/37 and 246/37.) (493436.)

3604. "Electric coil assemblies for high-frequency purposes." Ferrolyte Soc. A.R.L. and A. Kaufman. February 6th, 1937. (493346.)

5000. "Television and like systems." Baird Television, Ltd., and T. C. Nuttall. January 20th, 1938. (493279.)

5642. "Oscillation generators." Ferranti, Ltd., and M. K. Taylor. February 24th, 1938. (493142.)

6093. "Thermionic valve amplifiers." Telefunken Ges für Drahtlose Telegraphie. February 28th, 1936. (493136.)

6184. "Electron-discharge devices." Farnsworth Television, Inc. March 9th, 1936. (493140.)

6224. "Regulating devices for electric drives." British Thomson-Houston Co., Ltd. March 2nd, 1936. (Addition for 461444.) (493347.)

6232. "Arrangement for the interchange of energy between direct-current and alternating-current mains." Siemens-Schuckertwerke Akt.-Ges. March 2nd, 1936. (493143.)

6292. "Dynamo regulators." J. Lucas, Ltd., and J. A. Laird. March 3rd, 1937. (Cognate applications 7282/37 and 30817/37.) (493348.)

6713. "Electro-magnetic instrument for determining the orientation of a movable body in a magnetic field." U. Guerra. March 6th, 1937. (493352.)

9419. "Thermionic valve amplifiers." Philco Radio & Television Corporation. May 14th, 1936. (493289.)

9434. "Control of alternating-current motors." British Thomson-Houston Co., Ltd., T. H. Petch, jun., and H. W. C. Liddiard. April 2nd, 1937. (493354.)

9464. "Magnetically operated electric switches." A. Cianchi. April 2nd, 1937. (493355.)

9496. "X-ray tubes." N. G. Schonader. April 20th, 1936. (493146.)

9533. "Electric switches, particularly for refrigerators." British Thomson-Houston Co., Ltd. April 3rd, 1936. (493291.)

9569. "Electric systems for transmitting rotational movements." H. Blechschmidt and R. Munnich. April 5th, 1937. (Convention date not granted.) (493358.)

9616. "Electron multipliers." Fernseh Akt.-Ges. April 3rd, 1936. (493296.)

9620. "Automatic frequency control circuits for radio receivers." Marconi's Wireless Telegraph Co., Ltd. April 3rd, 1936. (Addition to 489094.) (493511.)

9633. "Electric lamps comprising combinations of electric-discharge devices with materials excited to luminescence by the radiation from the discharge therein." General Electric Co., Ltd., J. T. Randall and J. W. Ryde. April 5th, 1937. (493298.)

9634. "High-pressure mercury vapour electric-discharge lamps." General Electric Co., Ltd., V. J. Francis and J. W. Ryde. April 5th, 1937. (Cognate application 11398/37.) (493360.)

9636. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) April 5th, 1937. (Cognate applications 6263/38 and 6264/38.) (493361.)

9670. "Cathode-ray tube scanners." Telefunken Ges. für Drahtlose Telegraphie. April 4th, 1936. (493303.)

9693. "Polyphase rectification from a single-phase electricity supply." H. M. Harmer. April 6th, 1937. (493362.)

9699. "Television and like systems." Baird Television, Ltd., E. D. McConnell and H. G. Bruce. April 6th, 1937. (493304.)

9771. "Alternating-current amplifiers." Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough. April 6th, 1937. (493368.)

9772. "Frequency multiplying electrical circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and W. S. Mortley. April 6th, 1937. (493369.)

9773. "Radio and other carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd., and R. B. Armstrong. April 6th, 1937. (493370.)

9804. "Electric circuits employing discharge devices." British Thomson-Houston Co., Ltd., H. B. De Knight and B. G. Higgins. April 6th, 1937. (493374.)

9809. "Spark quenching arrangements for use in telephone or like systems." Automatic Telephone & Electric Co., Ltd., and W. Saville. April 6th, 1937. (493375.)

9821. "Secondary or storage batteries." Drumm Battery Co., Ltd., J. J. Drumm and A. G. Burnell. April 6th, 1937. (493515.)

9889. "Combinations and electric-discharge devices with materials excited to luminescence by the discharge through them." General Electric Co., Ltd., and J. T. Randall. April 7th, 1937. (493449.)

9920. "Electrical signalling apparatus." Gent & Co., Ltd., and C. Remington. April 7th, 1937. (493203.)

9932. "Electric kitchen stove or oven." E. Challet. April 7th, 1937. (493379.)

9989. "Contacts or contact tips for electric switches." A. West & Co., Ltd., and E. Babler. April 8th, 1937. (493454.)

10033. "Electric indicating or control systems." Wallace & Tiernan Products, Inc. April 17th, 1936. (493457.)

10177. "Electrical operation of railway points and signals." J. Woodforde and Westinghouse Brake & Signal Co., Ltd. April 9th, 1937. (493466.)

10187. "Electric-discharge tubes." Quarzlampen Ges. April 9th, 1936. (493520.)

10239. "Dynamo-electric machines." W. N. Kilner and Metropolitan-Vickers Electrical Co., Ltd. April 9th, 1937. (493523.)

10540. "Auxiliary apparatus for self-propelled electric vehicles." G. H. Fletcher, A. E. K. O. Grimsdale, and Metropolitan-Vickers Electrical Co., Ltd. April 13th, 1937. (493209.)

12103. "Inductances having adjustable high-frequency iron cores." E. Michaelis and E. Friedlander. April 28th, 1937. (493213.)

12183. "Electrical musical instruments." A. H. Midgley and A. M. Midgley. April 29th, 1937. (493320.)

12678. "Systems of control for electrically operated lifts." Express Lift Co., Ltd., and L. E. W. Wells. May 4th, 1937. (493322.)

14180. "Electron multipliers." Standard Telephones & Cables, Ltd. July 31st, 1936. (493217.)

14289. "Electric communication systems." Telephone Manufacturing Co., Ltd., L. H. Paddle and J. G. Flint. May 22nd, 1937. (493327.)

14723. "Electric circuit-interrupters with arc-extinguishing means." Westinghouse Electric & Manufacturing Co. May 29th, 1936. (493329.)

15146. "Electric heating elements and their manufacture." Revo Electric Co., Ltd., and F. H. Reeves. June 1st, 1937. (493331.)

16187. "Battery lamps." W. Maurice and Wolf Safety Lamp (Hiring) Co., Ltd. June 11th, 1937. (493223.)

16912. "Arc-welding apparatus." L. Jones and Metropolitan-Vickers Electrical Co., Ltd. June 17th, 1937. (493225.)

20071. "Control systems for electrically operated elevators." Westinghouse Electric & Mfg. Co. July 31st, 1936. (493227.)

21387. "Electric-discharge tubes and incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 5th, 1936. (493388.)

21544. "Earthing reactances." Maschinenfabrik Oerlikon. August 5th, 1936. (493228.)

22617. "Balancing out of higher harmonics in alternating-current electric circuits or apparatus." Siemens-Schuckertwerke Akt.-Ges. August 17th, 1936. (493230.)

24634. "Direction finding or homing systems." Telefunken Ges. für Drahtlose Telegraphie. September 9th, 1936. (493393.)

25215. "Insulating compounds and methods of making the same. British Thomson-Houston Co., Ltd. September 16th, 1936. (494395.)

25216. "Insulating compounds and methods of making the same." British Thomson-Houston Co., Ltd. September 16th, 1936. (493167.)

26501. "Directional lighting fittings adapted to co-operate with a linear source of light." General Electric Co., Ltd., and J. B. S. Smyth. September 30th, 1937. (493168.)

30638. "Electrical high-frequency transmission lines." Standard Telephones & Cables, Ltd. November 7th, 1936. (493235.)

30771. "Power transmission by electrical means." Sebrev Soc. d'Etudes et de Brevets. September 25th, 1937. (Addition to 484436.) (493402.)

31886. "Shock absorbing device for the steering gear of electric automobile cranes." Forges & Ateliers de Constructions Electriques de Jeumont. December 18th, 1936. (493177.)

33367. "Electric transformers." British Thomson-Houston Co., Ltd. December 3rd, 1936. (Cognate application 3368/37.) (493241.)

33540. "Ferraris electric meters." Siemens-Schuckertwerke Akt.-Ges. December 3rd, 1936. (Cognate applications 33541/37 and 33542/37.) (493242.)

33682. "Thermally actuated switches, relays and apparatus for fire-detection and like purposes." A. Blanc. December 8th, 1936. (493244.)

35551. "Multi-contact electric couplings." Remington Rand Inc. May 20th, 1937. (493247.)

36060. "Electrolytic production of metal coatings on objects with a non-conducting surface." Langbein-Pfanhauser-Werke Akt.-Ges. January 13th, 1937. (493485.)

1938

1438. "Electrode feeding mechanisms for arc lamps." C. Zeiss (a firm). January 27th, 1937. (493251.)

2603. "Thermionic valves." British Driver-Harris Co., Ltd. February 3rd, 1937. (493487.)

2669. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. January 28th, 1937. (493253.)

4970. "Electrical circuit-breaker having extinguishing chambers." Allmanna Svenska Elektriska Aktiebolaget and D. Ronnberg. February 17th, 1938. (493489.)

6850. "Inductance devices of the type employed as frequency changers." Standard Telephones & Cables, Ltd. April 29th, 1937. (493260.)

7642. "Liquid-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. March 11th, 1937. (493262.)

7861. "Supporting devices for X-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 17th, 1937. (493265.)

7885. "Automatic speed regulation of electric motors." British Thomson-Houston Co., Ltd. March 12th, 1937. (493495.)

9294. "Tubular electric resistance-heating elements." C. B. Backer. March 26th, 1938. (Addition to 484148.) (493499.)

9781. "Automatic responding means for use in telegraphic printers." C. Olivetti & Cia Soc. Anon, Ing. and G. Beccio. March 30th, 1938. (493500.)

10858. "Two-way directive wireless system." C. Lorenz Akt.-Ges. April 8th, 1937. (493429.)

11420. "Synchronous motor combination designed for the driving of contact-selectors of electric remote-control installations." Landis & Gyr Akt.-Ges. June 28th, 1937. (493270.)

14275. "Rigid crossing for electric trolley wires." R. Livingstone and Anti-attrition Metal Co., Ltd. May 13th, 1938. (493273.)

16394. "Electric circuit arrangements for operating electric discharge devices." General Electric Co., Ltd., J. N. Bowtell and H. G. Jenkins. April 8th, 1937. (Divided out of 10026/37.) (493526.)

Contract Information

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—November 15th. County Council. Electrical work at Hatton of Cruden housing estate. County Clerk, 22, Union Terrace.

Amesbury.—November 8th. R.D.C. One vertical borehole centrifugal pump and electric motor with all accessories. Lemon & Blizard, Lansdowne House, Castle Lane, Southampton (deposit £3 3s.).

Argentina. — BUENOS AIRES. — November 21st. National Sanitation Works Department. 1,340 electricity meters. (T.Y. 27794/38.)*

Australia.—BRISBANE.—November 22nd. Posts and Telegraphs Department. Lead-covered cable. (T. 28018/38.)*

GLADSTONE.—November 23rd. Electricity Authority. One 200-kVA and one 100-kVA alternator. (T. 28027/38.)*

Bedford.—November 18th. Electricity Department. Meters, waterheaters, cookers, cooker control units, kettles, meter boards and house service fuses for twelve months. (October 21st.)

Bingham (NOTTS).—November 10th. Wiring of thirty-five houses for lighting and power. C. W. Kendrick, surveyor, Council Offices (deposit £1).

Birkenhead.—November 15th. Electricity Department. Extra-high-voltage and low-voltage cable and electricity meters for twelve months. (October 28th.)

Birmingham.—November 23rd. Electric Supply Department. All-insulated switch-fuses for twelve months. (October 28th.)

November 15th. Borough Council. Electrical installation at the Derby Bath. (October 28th.)

Bognor Regis.—November 7th. U.D.C. Installation of electric lighting in 383 houses. (October 28th.)

Bury.—November 24th. Education Committee. Electrical installation at the new technical college. (See this issue.)

Dewsbury.—November 8th. Electricity Department. Low-voltage underground cables for twelve months. (October 28th.)

Doncaster.—November 5th. Lighting installation at a school. G. R. H. Danby, education offices.

November 11th. Wiring at Council houses. Surveyor, R.D.C. Offices, Nether Hall.

Droxford.—November 14th. R.D.C. One vertical borehole centrifugal pump and electric motor, with all necessary accessories, for the waterworks pumping station. West Meon, Hampshire. Lemon & Blizard, Lansdowne House, Castle Lane, Southampton (deposit £3 3s.).

Edinburgh.—November 7th. Managers of the Royal Edinburgh Hospital for Incurables. Electrical and heating work at the nurses' home. J. Douglas Miller, architect, 30, Walker Street (deposit £1 1s.).

Fife.—November 7th. County Council. Electric lighting at forty houses at Lumphinnans (deposit £1 1s.). Electric lighting at thirty-six houses at Wellwood, Dunfermline. County Clerk, Cupar, Fife (deposit £1 1s.).

November 15th. Electrical and heating installations at Viewforth School, Kirkcaldy. James Gentles & Son, Central Chambers, High Street, Kirkcaldy (deposit £1 1s.).

Greenock.—Corporation. Electric lighting at 258 houses at Bow Farm estate. Town Clerk.

Grimsby.—November 11th. Electricity Department. P.i., lead-covered, Hessian taped, armoured cables for twelve months. (See this issue.)

Halifax.—November 14th. Housing Committee. Electrical installation work at the Backhold Lane and Nursery Lane estates. Town Clerk, Town Hall (deposit £2 2s.).

Hebburn-on-Tyne.—U.D.C. Installation of electrical services in 120 houses. E. G. Lediard, surveyor.

Herefordshire.—County Council. Electric lighting and power, electric clocks, call bells, fire alarms, emergency lighting and lifts for a proposed new hospital and adaptations at the existing public assistance institution. (October 21st.)

Hull.—November 14th. Town Council. Trolley-bus overhead equipment, including tubular steel poles, trolley wire and overhead fittings. General manager, Transport Offices, Ferensway.

Ilford.—November 12th. Electricity Department. Eight 500-kVA transformers. (See this issue.)

Leyton.—November 10th. Electricity Department. Extra-high-voltage switchgear and reactor equipment. (October 28th.)

Lichfield.—Electricity Department. Street lighting equipment for lighting the Friary. (October 28th.)

London.—BETHNAL GREEN.—November 18th. Electricity Undertaking. One 750-kVA transformer. (October 28th.)

Louth.—November 21st. Electricity Department. P.i. lead-covered, low-voltage cables. (October 28th.)

Maidstone.—November 26th. Kent County Council. Electrical installation in connection with third scheme of development at Leybourne Grange Colony. County architect, Springfield (deposit of £5 5s.).

Manchester.—November 11th. Electricity Department. Electric water heaters for twelve months. (October 28th.)

Musselburgh.—November 14th. Town Council. Electrical work at eighty-nine houses. Town Clerk.

Newcastle-on-Tyne.—City Council. Electric lighting installation at the new maternity wards at the General Hospital. Electric lighting in 141 flats in the Bentick area. R. G. Roberts, city architect, 18, Cloth Market.

Newton-in-Makerfield.—November 11th. Electricity Department. Two 400-kVA transformers and one 11-kV switchboard. (October 21st.)

Peterborough.—November 7th. Town Council. Three sets of Diesel oil engines driving centrifugal pumps, together with appurtenant works, for Wilsthorpe waterworks pumping station. City engineer, Town Hall (deposit £3 3s.).

Portsmouth.—November 14th. Electricity Undertaking. One 50-kVA voltage regulator and three 500-kVA transformers. (See this issue.)

Rochdale.—November 22nd. Electricity Department. AC 5-A and 25-A quarterly and prepayment meters for twelve months. (October 28th.)

St. Helens.—November 11th. Electricity Department. High- and low-voltage p.i. cables. Salt glazed stoneware ducts and cable protection tiles. (October 21st.)

South Africa.—PORT ELIZABETH.—November 24th. City Municipality. Two miles of low-voltage cables and quantities of 250-V lamps. (T.Y. 28130/38.)*

JOHANNESBURG.—November 12th. City Council. One 750-kW automatic rotary convertor. (T.Y. 27731/38.)*

November 12th. Insulated wire for twelve months. (T.Y. 28241/38.)*

November 17th. Electricity Department. 20,000-V 0.25 sq. in. three-core screened cable, pilot cable, joints and auxiliary appliances. (T.Y. 28146/1938.)*

CAPE TOWN.—November 24th. Electricity Department. Overhead line material. (T. 27775/1938.)*

December 14th. Low-voltage pole mounting fuse holders and high-rupturing-capacity fuses. (T.Y. 27985/38.)*

PRETORIA.—December 1st. Union Tender and Supplies Board. 1,000,000 insulated, fibre head, 1-in. nails. (T.Y. 27999/38.)*

November 17th. Steam cooking apparatus. (T. 27998/1938.)*

November 24th. Batteries for motor vehicles for twelve months. (T. 28140/38.)*

December 1st. Fifty portable type field telephones. (T. 28002/38.)*

December 8th. Switchboards. (T.Y. 28272/38.)*

Southampton.—November 22nd. Electricity Department. One 15-ton electric trolley locomotive for the generating station. Western Esplanade. (October 21st.)

Uruguay.—MONTEVIDEO.—November 17th. Electricity Supply and Telephones Administration. 20,000 metres of twin v.i.r. cable. (T.Y. 27835/38.)*

November 18th. 400,000 metres of lead-covered cable. (T.Y. 27836/1938.)*

November 21st. 400,000 metres of twin v.i.r. cable. (T.Y. 27837/38.)*

November 22nd. 600 double-pole throw-over switches. (T.Y. 28207/38.)*

Orders Placed

Birmingham.—Accepted. Lighting installation in the second portion of the new senior boys' school to be erected at Lea Village, Yardley (£1,050).—H. Pratt.

Blackpool.—Education Committee. Accepted. Electrical installation at Stanley school.—J. W. Fielding.

Chester.—Education Committee. Recommended. Installation of electric lighting at the city and county schools (£2,146).—W. Caton & Son.

Eccles.—Highways Committee. Accepted. Electrical installation at sewage works (£43).—S. Watkins.

Chesterfield.—Electricity Committee. Accepted. Portable 250-kVA sub-station (£295).—Met.-Vick. Electrical Co.

Durham.—Education Committee. Accepted. Repairs to the electrical installation at the Brancepeth school (£220).—R. Robson. Electrical installation at a new gymnasium at the Blaydon Secondary school (£141).—Falconar, Cross & Co.

Glasgow.—Transport Committee. Accepted. Trolley wire (£3,602).—B.I. Cables. Tubular heaters.—J.P. Tubular Heater Co. Electric lamps.—Aurora Lamps. Solid drawn conduit and sundries.—Simplex Electric Co. Spares.—G.E.C. Covered copper wire.—London Electric Wire Co. and Smiths. Motor spares.—Met.-Vick. Electrical Co.

Corporation. Recommended. Installation of neon signs and electrical fittings at various halls: Neon signs.—Signcrafts. Electrical fittings.—Falk, Stadelmann & Co.; G.E.C.

Special Committee of the Cleansing Department. Recommended. Equipment required for an electrostatic precipitation process for preventing the nuisance caused by the emission of grit from the refuse destructor at Govan (£66,000).—James Howden & Co. (Land); Lodge-Cottrell.

Hastings.—Electricity Committee. Accepted. Eighty auto-valve lightning arresters (£536).—Met.-Vick. Electrical Co.

London.—ST. PANCRAS.—Contracts and Stores Committee. Recommended. 200 street lighting standards (£697).—Revo Electric Co. Meters for twelve months.—Chamberlain & Hookham.

STEPNEY.—Finance and Parliamentary Committee. Recommended. Twenty-one AC motors with starting equipment (£226).—Laurence, Scott & Electromotors. Water heaters for twelve months.—Santon; Thermics. Electric kettles for use in connection with the Council's domestic hire scheme.—G.E.C.

Malton.—Housing Committee. Recommended. Electrical installations at council houses (£286).—Watson & O'Connor.

Manchester.—Electricity Committee. Accepted. Electric van.—Morrison & Sons. Battery for a 10-ton electric cable float.—Chloride Electrical Storage Co.

Mansfield.—Fire Brigade Committee. Accepted. Installation of telephones, alarm bells, &c., at fire station.—Carter & Co. (Nelson).

Newcastle-on-Tyne.—City Council. Accepted. Installation of electric lighting at the hangar at the Municipal Airport (£176).—Falconar, Cross & Co.

Portsmouth.—Electricity Committee. Accepted. Cable for Havant (£894).—Johnson & Phillips.

South Shields.—Town Council. Accepted. Deep X-ray equipment for the Ingham Infirmary.—Solus Electric Co. (£1,984); Newton Wright (£1,830).

Tottenham.—Baths Committee. Accepted. Stage lighting at hall (£50).—D. Walter & Co.

Weymouth.—Entertainments Committee. Accepted. Stage dimmer switchboard and auxiliary equipment (£126).—Falk, Stadelmann & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Cinema, High Street; W. Willis, architect, Globe Buildings, Penylan, Cardiff.

Alnwick.—Houses, Radcliffe; R.D.C. surveyor.

Barking.—Thirteen shops and flats, London Road; Cricklewood Property Trust, Ltd., 7, Park Lane, London, W.1.

Bedale.—Houses (18), for U.D.C.; J. R. White, architect, County Hall, Northallerton.

Billingham-on-Tees.—Houses (16), Bedale Avenue, for the U.D.C.; Kitching and Co., architects, 21, Albert Road, Middlesbrough.

Birmingham.—Factory and offices, Highlands Road, Shirley, for the Gear Grnidng Co., Ltd., Handsworth; Wood Kendrick & E. F. Reynolds, architect, 57, Colmore Row, Birmingham. Extensions to factory for Charles Wade & Co., Ltd., Pritchett Street.

Blackpool.—Cinema, Collingwood Avenue, for A. Hall; Halstead Best, architect. Pavilion, &c., North Pier; Blackpool Pier Co.,

Blaenavon.—Houses (58), for the U.D.C.; surveyor, Council Offices.

Brighouse.—Houses, Dewsbury and Elland Road, Rastrick; G. & G. H. Crowther, 1, Princess Street, Huddersfield. Extensions to works and offices, Birdsroyd Lane; Helliwell & Co., Ltd.

Brighton.—Houses (117), Redhill Farm estate, Patcham; T. G. Thompson. Community centres; borough engineer.

Cardiff.—Two factories, Treforest estate; Sir Alexandra Gibb & Partners, Queen Anne Lodge, London, S.W.1.

Chelmsford.—Flats and houses, Bridge Road and Rainsford Lane; borough engineer.

Cheltenham.—Extensions to fire station (£8,815); borough engineer. Extensions to Winchcomb Hospital; secretary.

Coventry.—Museum and art gallery, Earl Street; Sir Alfred Herbert. Offices and showrooms, Silver Street, for Matterson, Huxley & Watson, Ltd., Hales Street; G. Cave, architect, Little Park Street. Extensions to technical college, for the E.C.; A. W. Hoarse, architect, Trinity Churchyard.

Desborough.—Extensions to school (£10,000); A. Tailby & Son, Ltd.

Devonshire.—Tuberculosis hospital, for County Council; county architect, Exeter.

Dudley.—Houses (32), Pitfield Row; borough engineer. Two shops, Castle Street (£3,270); Mark Round & Sons, Ltd.

Dundee.—Cinema, Albert Street; W. Pennycook.

Edinburgh.—Factory, 240, Easter Road, for David Tod, Ltd.; the manager. Reconstruction of Waverley Market, for the Corporation, city architect.

Enfield.—Houses, Cowland Avenue and Park Road; Goodchild & Co. Shops and flats, Hertford Road; Marshall & Tweedy. Enlargement of Brimsdown school (£14,600), for the E.C. Extensions to factory, Queensway; Leopold Farmer & Sons.

Gateshead.—Cinema, Bensham Road; H. S. Smelt, builder, Fellside, Whickham, Co. Durham. Nurses' home (£20,000) and schools, Elgin Road (£69,000), and Lobley Hill (£63,000), for the T.C.; borough engineer.

Hampshire.—Schools (£200,000), for the E.C.

Handforth (CHESHIRE).—Houses (70), Stanley Road; G. M. Holt, builder, 4, Hereford Street, Sale.

Harrow.—Cinema and shops, Uxbridge Road; H. J. Hewlitt.

Hastings.—School, Red Lake, Ore (£23,400); Ringmer Building Works, Ltd.

Hexham.—Houses (20), Fourstones, for the R.D.C.; Johnston Brothers, builders, The Leazes, Burnopfield.

High Wycombe.—School, near Hatters Lane (£56,000), for the Borough Council.

Keighley.—Baths (£38,800); borough engineer.

Lancashire.—School, Farington, for the County E.C.; John Turner & Sons (Preston), Ltd., contractors, William Henry Street, Preston.

Leeds.—Factory and offices, for Jackson's, Ltd., Newcastle-on-Tyne; Stephenson & Gillis, architects, Saville Place, Leeds.

Leicester.—Additions to Institution (£40,000); Pick, Everard Keay and Gimson, architects, 6, Millstone Lane.

Liverpool.—Showrooms and offices, Myrtle Street, for Cheshire Bros., Ltd.; Costain & Son, builders. Works and offices, Speke, for Milners Safe Co., Ltd., 12/13, Newgate Street. London, E.C.1; W. Tomkinson & Sons, contractors, 7/31, Great Newton Street, Liverpool, 3.

London.—(BERMONDSEY).—Flats (53), Enid Street; borough engineer. Stores, 35-7, Brunel Road; Stewart & Hendry, 90, Fenchurch Street, E.C.3. (PADDINGTON).—Houses, 14-26, Gloucester Terrace, and 4-8, Westbourne Crescent; Guy Morgan & Partners, 9, Gower Street, W.C.1. (ST. MARYLEBONE).—Cinema, shops and flats, Baker Street; Wimperis, Simpson & Guthrie, 61, South Molton Street, W.1.

Mansfield.—Extensions to the Forest Hospital, for the Health Committee; Waude Thompson, borough surveyor.

Meriden.—Houses, Elmfield Road and Manor Bank Road and Whalley Crescent, Castle Bromwich; A. Walker & Son, Ltd., High Street, Coleshill.

Merthyr Tydfil.—Houses (216), Galon Uchaf; borough engineer.

Middlesbrough.—Houses (14), Glendale Road; N. Thompson, Ltd., builders, Stonehouse Street, Linthorpe. Improvements to West Lane Hospital and Municipal Hospital (£5,000); borough engineer.

Middlesex.—Alterations to Harrow County School for Boys (£43,261), for the County Council; H. C. Jones, Ltd., Luton.

Morecambe.—Houses (13), Ruskin Drive; Widdup & Ladell. Houses (16), Winchester Avenue; Russell Bros. Rebuilding premises, Sandylands, for the Lancaster & District Co-operative Society, Ltd.; R. H. Jackson, architect, Church Street, Morecambe.

Newcastle (STAFFORDSHIRE).—Houses (16); P. F. Bradshaw, Clayton Road estate. Houses, Bradwell Hall Farm estate; 1933 Housing Society, Ltd., Essex Street, Strand, London, W.C.2. Houses, Oaklands Avenue, Porthill, Inglewood Drive, Porthill; L. Bates, Ellison Street, Wolstanton. Additions and alterations to Hassell Street school, for the E.C.; Madew & Wardle, contractors, Central Works, Lower Street, Newcastle-under-Lyme.

Northampton.—Block of shops and offices fronting on Abingdon Street; A. F. Allen, architect, Albion Place. School, Rothwell, for the County E.C.

North Shields.—Block of shops, Saville Street, for Montague Burton, Ltd.; Hastie D. Burton, Ltd., builders, King Street.

Northumberland.—School, Bedlington East, for the County E.C.; W. W. Tasker, County Hall, Newcastle-on-Tyne.

Nottingham.—Extensions to central premises, for the Nottingham Co-operative Society, Ltd., Upper Parliament Street, and boot repairing factory, Meadow Lane; W. V. Betts & Son, architects, 2, St. Peter's Church Walk.

Oldbury.—Council offices, Wolverhampton Road (£45,000); Harvey & Wicks, architects. School, Causeway estate, for the E.C.

Paisley.—Additions to the Paisley grammar school; Abercrombie & Steel Maitland, architects, County Square.

Portsmouth.—Hotel, Eastern Road; F. J. Privett, Ltd. School, West Cosham (£14,343), for the E.C.

Preston.—Cinema (£30,000), Long Lane; G. Tonge, architect, Lord Street, Southport. Factory, Dundonald Street, for the Cliff, Spinning Co., Ltd.; Bradshaw, Gass & Hope, architects, 19, Silverwell Street, Bolton.

Rawtenstall.—Reconditioning of schools (£7,725), for the E.C.

Rochdale.—Market (£58,950); borough engineer.

Rochester.—School, Frindsbury (£44,334), for the E.C.

Rugby.—Warehouse, offices and showrooms, Russell Street, for the Rugby Co-operative Society, Ltd.

Ruislip.—School, Garden estate (£38,070); Nox, Ltd.

Seaham Harbour.—Municipal buildings and recreational centres (£50,000); U.D.C. surveyor.

Seaton Delaval (NORTHUMBERLAND).—Maternity centre and clinic; W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Sheffield.—Assembly Hall, Mappin Street, for the Royal Institution for the Blind; R. Cawkwell, architect, 19, St. James Street.

Shipley.—Houses (26), Wrose Mount; Walton & Brown.

Shropshire.—School, Hadley; McKeand, Smith & Co., builders, Showell Road, Bushbury, Wolverhampton.

Stourbridge.—Arcade of shops, near High Street; T. W. Edwards & Son, builders, Audnam, Stourbridge.

Stretford.—Central fire station (£28,226); borough engineer.

Sunderland.—School, Whitburn Street, for the E.C.; O. H. Mark, architect, John Street.

Sutton Coldfield.—Houses (55), Westwood Road; British Ensign Builders, Ltd.

Tamworth.—Houses (96), Manor Farm estate, for the T.C.; Eddie & Co., contractors, Wolverhampton.

Taunton.—Warehouse and office buildings, Creech Heathfield; Samson & Colthurst, architects, Hamilton Street, Taunton.

Tynemouth.—Gymnasium at the Linskill senior school, for the T.C.; B. Peel, Ltd., builder, East Mill Works, North Shields.

Wakefield.—Block of shops and offices, Westmorland Street and the Bull Ring; L. Ives, city engineer and surveyor.

Warrington.—Houses, Crosby and Charter Avenues, for Greenwood Bros., Ellen Street; Pierpoint & Worthington, architects, 31, King Street, Wigan.

Warwickshire.—School, Dunchurch Road, Rokeley estate, Rugby; A. C. Bunch, county architect, The Shire Hall, Warwick.

Weston Favell.—Estate development; A. Glenn & Sons, builders, Northampton.

Weymouth.—Hotel, shops and skating rink, Lodmoor; W. White. School, Radipole, for the E.C.

Windsor.—Block of shops and offices fronting on Peascod Street; Bridge Walker, Ltd., builders, Brixton, London, S.W.2.

Wolverhampton.—Houses (10), Springhill estate; W. Banister & Co.

Wood Green.—Council offices and sessions house (£92,119); borough engineer.

Worsley.—Houses (34), Hulton estate; U.D.C. surveyor.

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 26th:—

Black Triangle (design only). No. 586959. Class 4 (III). Arc lamp carbons.—Morgan Crucible Co., Ltd., Battersea Works, Church Road, Battersea, S.W.11.

Little Briton (lettering and design). No. 585915. Class 13. (III). Electric switches (ordinary), electric switches (ordinary) combined with plug and socket couplings, plug and socket couplings, switch covers, plates, boxes and bases, and bell pushes, all made of ordinary metal.—C. H. Parsons, Ltd., Britannia Works, Wharfdale Road, Tyseley, Birmingham.

Alpha. No. 600040. Class 9 (IV). Electric batteries.—Alpha Accessories, Ltd., Lockfield Avenue, Brimsdown, Enfield, Middlesex.

Orsig. No. 601017. Class 11 (IV). Incandescent electric lamps.—Société Lampes et Entreprises Electriques, Ninove, Belgium. (British representatives, Cope & Co., 65, Victoria Street, Westminster, S.W.1.)